DANA SPICER®
Off-Highway Products

Service Manual

Axle
37RF116
43RF175

ASM-0148
January 2012

TECHNICAL DESCRIPTION

Description
The axle assembly has a spiral bevel type ring gear and pinion with further reduction provided by a planetary gear set.

Primary Reduction
The spiral bevel pinion and ring gear transmit power through the center differential pinions, side gears and planetary gear sets to the axle shafts. The spiral bevel differential assembly is mounted on tapered roller bearings, which are adjusted by the positioning of the two threaded adjusting nuts mounted in the differential carrier and cap assembly. The tapered roller pinion bearing preload is adjusted and maintained by a precision ground and hardened spacer positioned between the pinion nut and shaft shoulder.

Secondary Reduction
In the trumpet arm is a self-centering sun gear that drives four planetary gears. These gears in turn mesh with and react against a rigidly mounted internal gear. The planet gears rotate on roller bearings mounted and retained in the planet carrier, which in turn drives the axle shaft. Positive lubrication keeps all moving parts bathed in lubricant to reduce friction, heat and wear.

Internal Liquid Cooled Brakes
The multiplate liquid cooled brakes are located between the differential carrier and the trumpet arm. Reaction discs are tanged to the trumpet interior; friction discs are splined to the sun gear shaft. The hydraulically activated piston is mounted in the differential carrier. Brake torque is produced by applying hydraulic pressure to the piston, which applies axial force to the brake friction and reaction discs, generating torque at the sun gear shaft. When hydraulic pressure is released springs push the piston back releasing the brake.

FOREWORD

This manual has been prepared to provide the customer and maintenance personnel with information and instructions on the maintenance and repair of Dana Products.

Extreme care has been exercised in the design and selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, it's principle of operation, troubleshooting, and adjustments it is urged that mechanics study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only Dana approved parts as listed in the applicable parts manual should be used. Use of "will fit" or non-approved parts may endanger proper operation and performance of the equipment. Dana does not warrant repair, replacement parts or failures resulting from the use of parts which are not supplied or approved by Dana. Important: Always furnish serial and model numbers when ordering parts.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damaged, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the machine. If replacement parts are required the part must be replaced with a Dana specified replacement part. Do not use a replacement part of lesser quality.

The service procedures recommended in this manual are effective methods of performing service and repair. Some of these procedures require the use of purpose designed tools.

Accordingly, anyone who intends to use a replacement part, service procedure or tool which is not recommended must first determine that neither his safety or the safe operation of the machine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various "Cautions and Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair. Improper service or repair may damage the unit or render it unsafe. It is important to understand that these "Cautions and Notices' are not exhaustive. It is impossible to warn of all possible hazardous consequences that may result from following or failing to follow these instructions.

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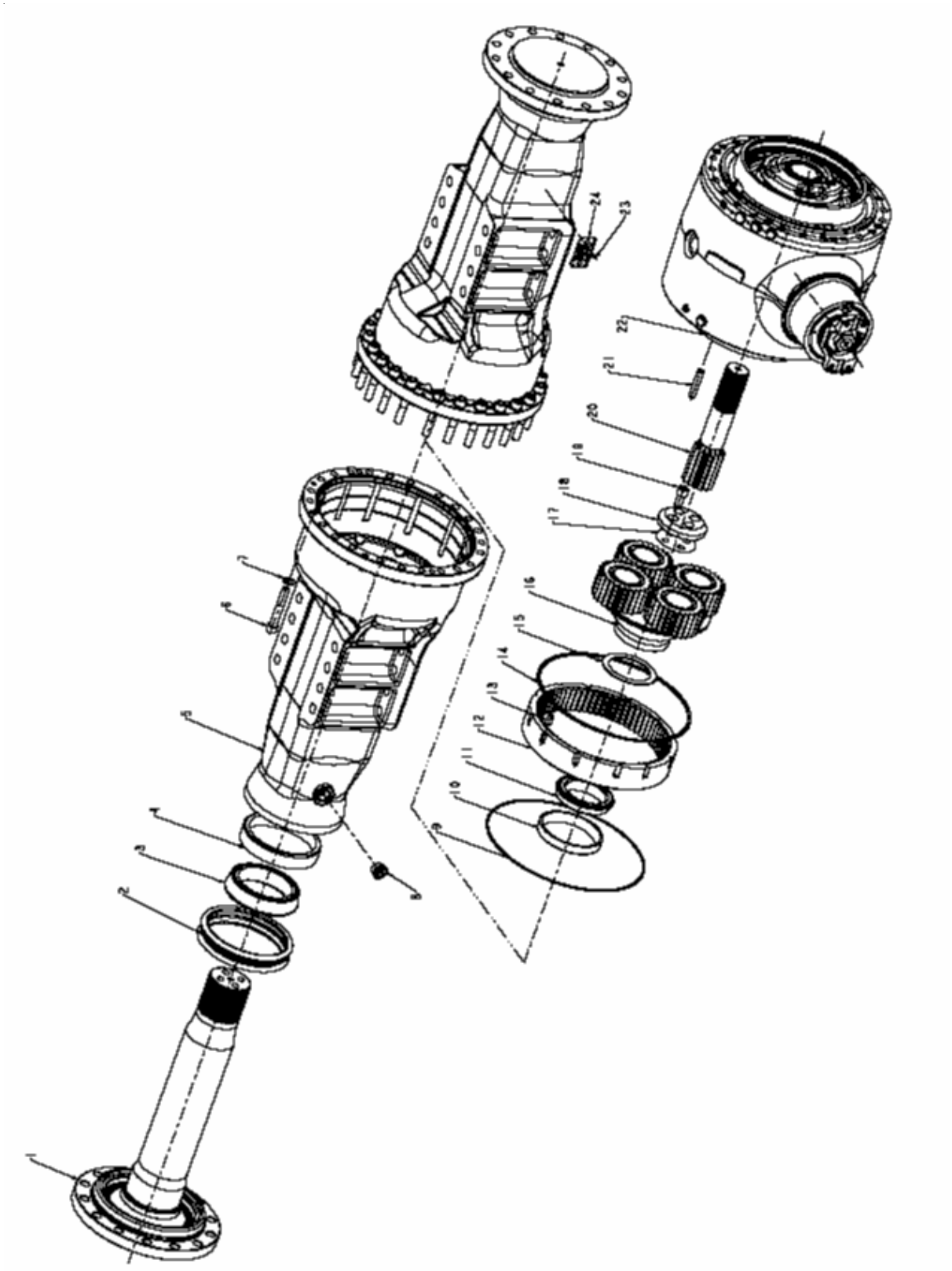
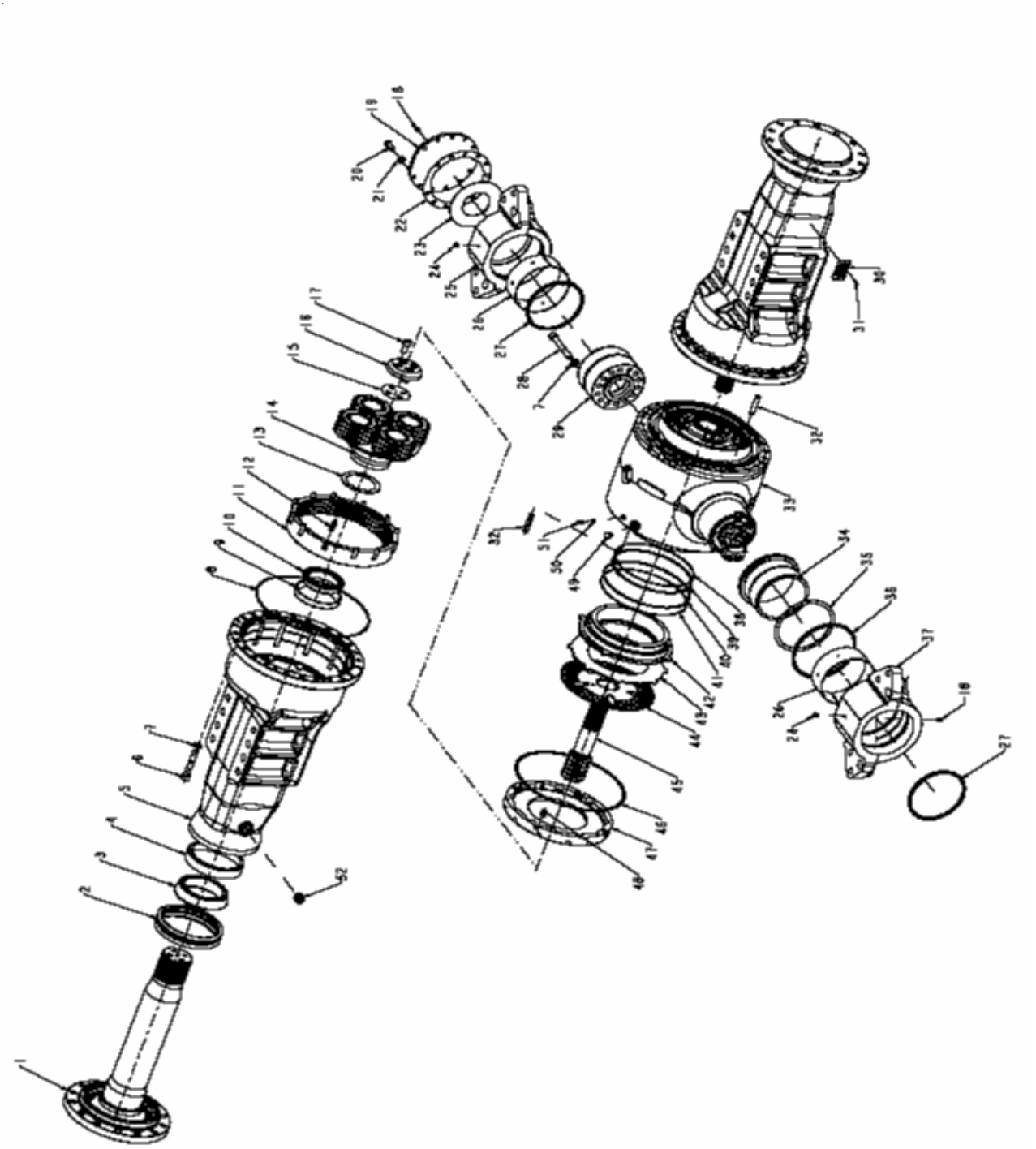


PAD MOUNT AXLE WITHOUT BRAKE
PARTS DESCRIPTION

ITEM	DESCRIPTION	QTY
1	Axle Shaft	2
2	Face Seal	2
3	Bearing Cone	2
4	Bearing Cup	2
5	Trumpet Arm Housing	2
6	Socket Head Screw	48
7	Washer	48
8	Magnetic Plug and O-Ring	2
9	O-Ring	2
10	Bearing Cup	2
11	Bearing Cone	2
12	Internal Ring Gear	2
13	Dowel Pin	24
14	Retaining Ring	2
15	Bronze Spacer	2
16	Planet Carrier Assembly	2
17	Shim 0.10, 0.18, 0.25, 0.50	AR
18	Clamp Plate	2
19	Socket Head Screw	8
20	Sun Gear	2
21	Dowel Pin	2
22	Differential Carrier Assembly	1
23	Screw	4
24	I.D. Plate - Not Serviceable	NA

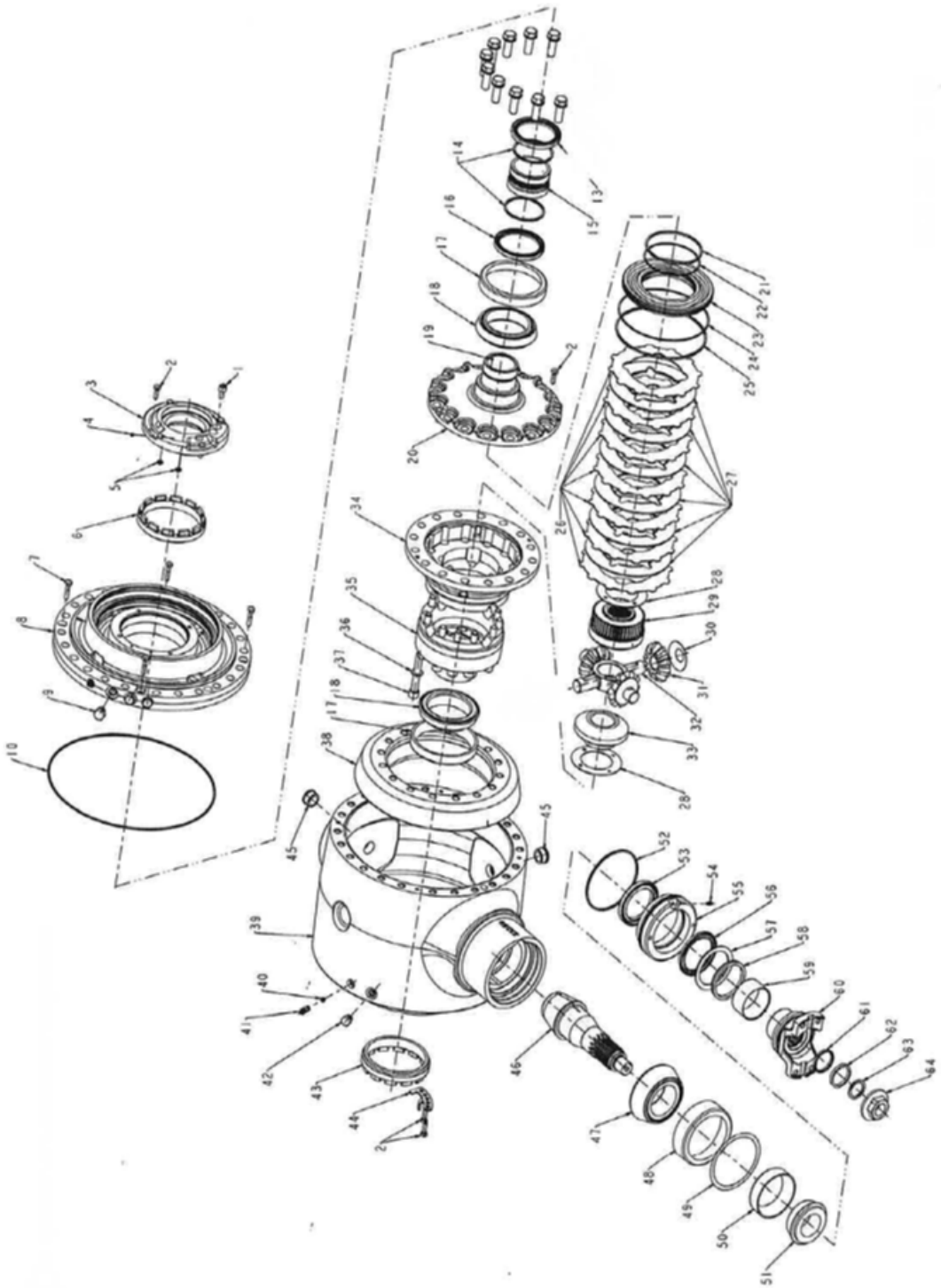
TRUNNION MOUNT AXLE WITH BRAKE
EXPLODED VIEW



TRUNNION MOUNT AXLE WITH BRAKE
PARTS DESCRIPTION

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Axle Shaft	2	27	Seal	2
2	Face Seal	2	28	Socket Head Screw	14
3	Bearing Cone	2	29	Trunnion Journal	1
4	Bearing Cup	2	30	I.D. Plate - Not Serviceable	NA
5	Trumpet Arm Housing	2	31	Screw	4
6	Socket Head Screw	48	32	Dowel Pin	2
7	Washer	62	33	Differential Carrier Assembly	1
8	O-Ring	2	34	Trunnion Sleeve	1
9	Bearing Cup	2	35	Thrust Washer	1
10	Bearing Cone	2	36	Seal	1
11	Internal Ring Gear	2	37	Rear Trunnion	1
12	Dowel Pin	24	38	Piston Inner Backup Ring	2
13	Bronze Spacer	2	39	Piston Inner Seal	2
14	Planet Carrier Assembly	2	40	Piston Outer Seal	2
15	Shim 0.10, 0.18, 0.25, 0.50	AR	41	Piston Outer Backup Ring	2
16	Clamp Plate	2	42	Piston	2
17	Socket Head Screw	8	43	Reaction Plate	2
18	Pressure Relief Valve	2	44	Friction Plate	2
19	Trunnion Cap	1	45	Sun Gear	2
20	Cap Screw	12	46	Retaining Ring	2
21	Washer	12	47	Brake Abutment	2
22	Shim .004", .007", .010", .020"	AR	48	Spring	8
23	Thrust Washer	1	49	Plug	2
24	Plug	2	50	Seat Insert	2
25	Front Trunnion	1	51	Bleeder Screw	2
26	Bushing	2	52	Magnetic Plug and O-Ring	2

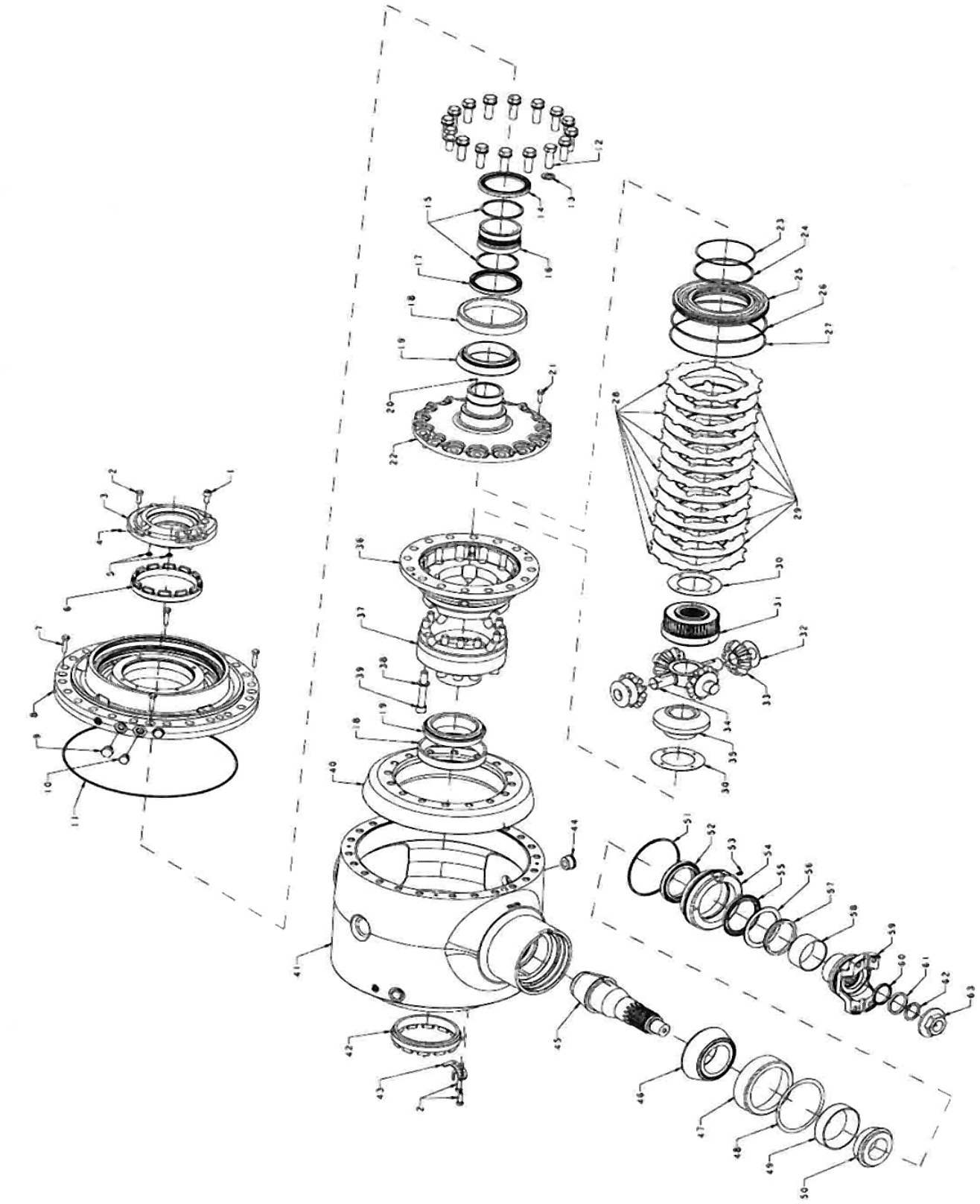
PAD MOUNT HYDRALOC DIFFERENTIAL
EXPLODED VIEW



PAD MOUNT HYDRALOC DIFFERENTIAL
PARTS DESCRIPTION

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Socket Head Screw	1	33	Side Gear	1
2	Cap Screw	4	34	Differential Case Assembly	1
3	Seal Retainer with (2) Plugs	1	35	Case - Differential Half	1
4	Plug	1	36	Washer	12
5	Seal Ring	2	37	Capscrew	12
6	Nut - Differential Bearing Adj.	1	38	Ring Gear	1
7	Cap Screw	4	39	Housing Carrier	1
8	Retainer - Differential	1	40	Seat Insert	2
9	Plug - Tank Port	1	41	Screw - Brake Bleeder	2
9A	Plug - Pressure Port	1	42	Plug	2
10	O Ring	1	43	Nut - Differential Bearing Adj.	1
11	Cap Screw	16	44	Lock - Differential Adj. Nut	1
12	Washer	16	45	Plug - Magnetic	2
13	Seal - Outer	1	46	Pinion	1
14	Ring - Piston	2	47	Pinion Bearing Cone - Inner	1
15	Sleeve Wear	1	48	Pinion Bearing Cup - Inner	1
16	Seal Inner	1	49	Shim .004",.007",010"	AR
17	Cup	2	50	Pinion Bearing Cone - Outer	1
18	Cone Bearing	2	51	Pinion Bearing Cup - Outer	1
19	Metric Plug - 3mm	1	52	O Ring	1
20	Flange Half	1	53	Seal - Pinion	1
21	Seal - Ring Inner	1	54	Grease Fitting	1
22	Ring - Inner Backup	1	55	Cartridge Seal Retainer	1
23	Piston	1	56	Seal - Grease	1
24	Seal - Ring Outer	1	57	Thrust Washer	1
25	Ring - Outer Backup	1	58	Seal - V Ring	1
26	Plate - Reaction	7	59	Sleeve Wear	1
27	Plate - Friction	6	60	Flange	1
28	Washers - Side Gear	2	61	O Ring	1
29	Splined Hub Gear	1	62	Spacer O Ring	1
30	Thrust Washer	4	63	Spacer Pinion	1
31	Pinon - Side Differential	4	64	Nut - Pinion Shaft	1
32	Spider - Differential	4			

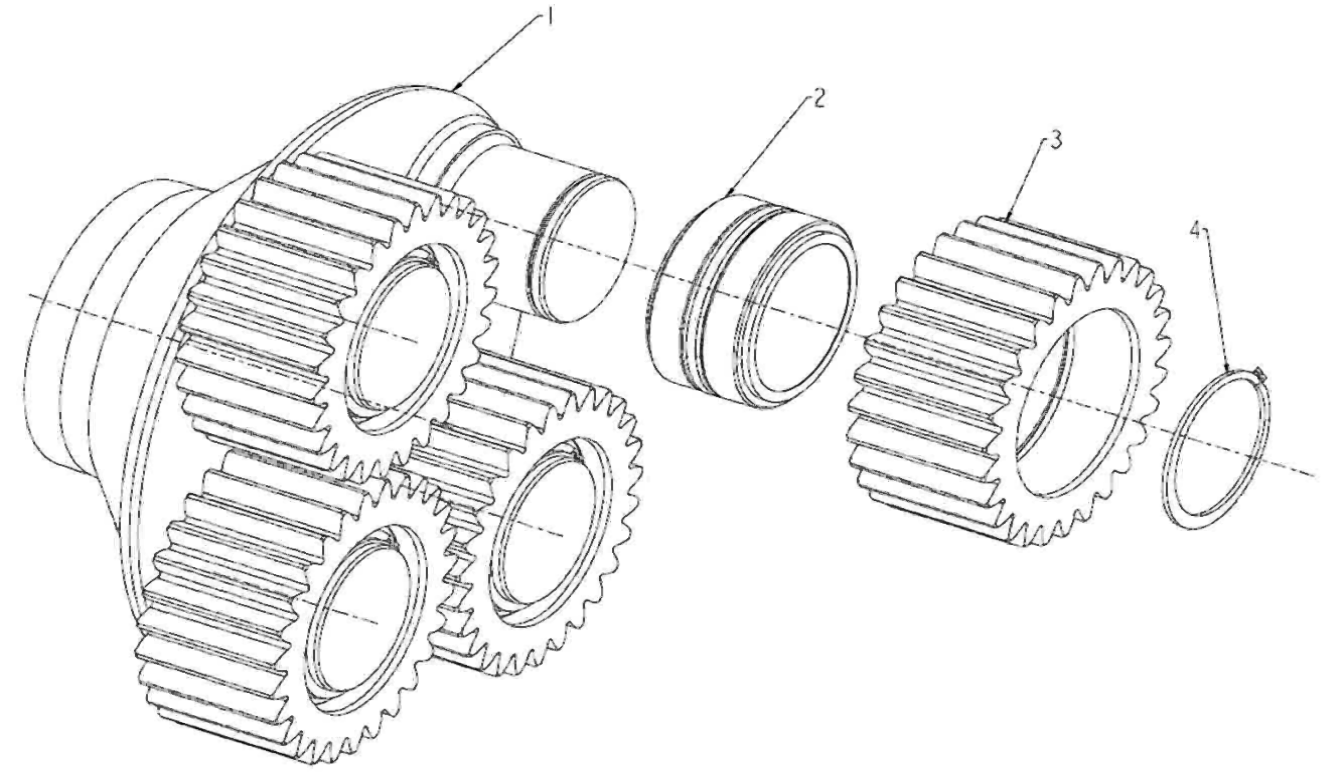
TRUNNION MOUNT HYDRALOC DIFFERENTIAL EXPLODED VIEW



TRUNNION MOUNT HYDRALOC DIFFERENTIAL
PARTS DESCRIPTION

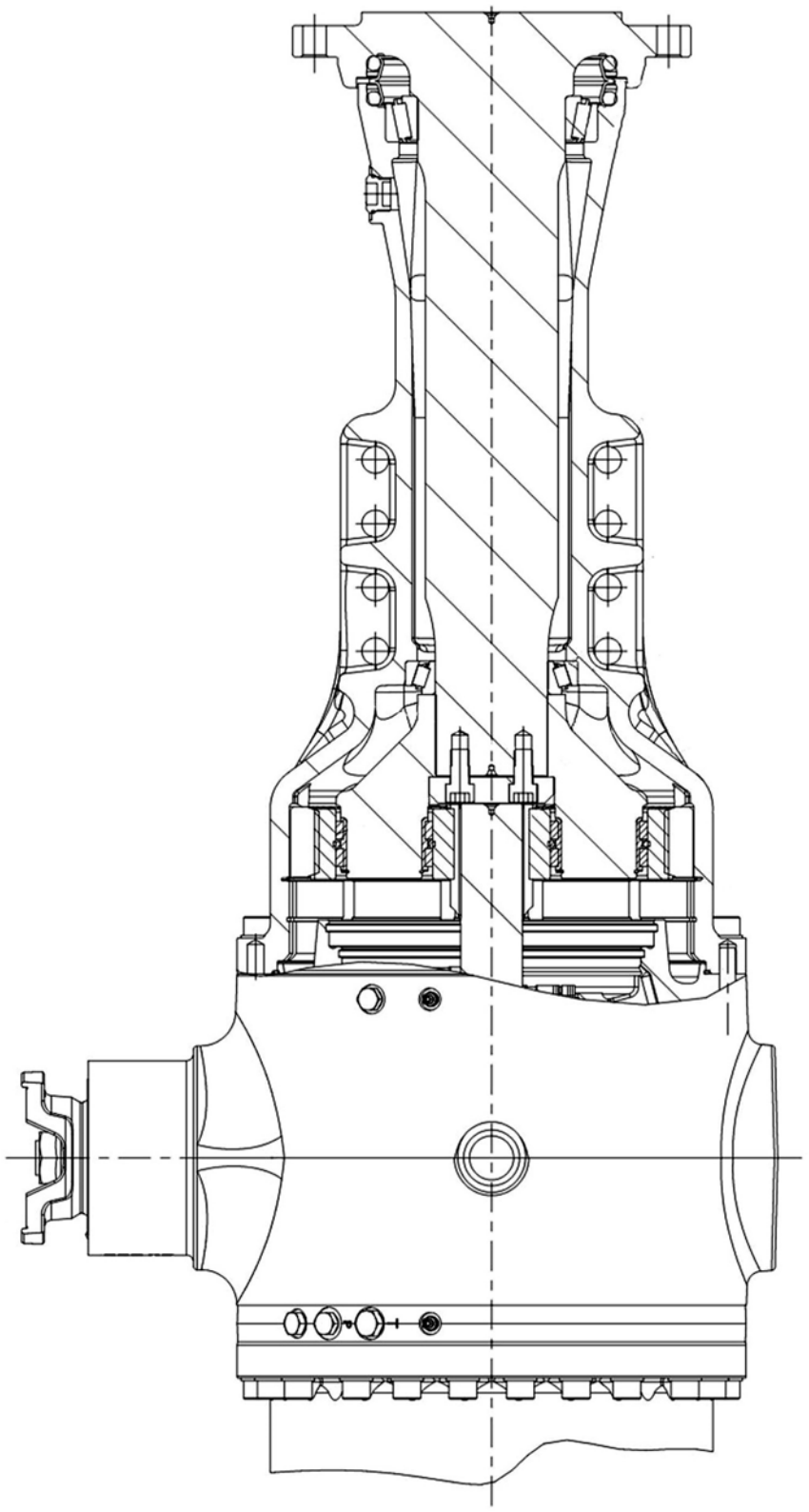
ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Socket Head Screw	1	33	Pinion Gear	4
2	Cap Screw	6	34	Differential Spider	1
3	Seal Retainer	1	35	Side Gear	1
4	Plug	1	36	Differential Case Flange Half	1
5	Seal Ring	2	37	Differential Case Plain Half	2
6	Differential Bearing Adjusting Nut	1	38	Washer	12
7	Cap Screw	4	39	Cap Screw	12
8	Differential Retainer	1	40	Ring Gear	1
9	Plug	1	41	Carrier Housing	1
10	Plug	1	42	Differential Bearing Adjusting Nut	1
11	O-Ring	1	43	Differential Bearing Adj Nut Lock	1
12	Cap Screw	16	44	Magnetic Plug and O-Ring	2
13	Washer	16	45	Pinion Gear	1
14	Outer Seal	1	46	Pinion Bearing Cone	1
15	Piston Ring	2	47	Pinion Bearing Cup	1
16	Wear Sleeve	1	48	Shim .004", .007", .010"	AR
17	Inner Seal	1	49	Pinion Bearing Cup	1
18	Bearing Cup	2	50	Pinion Bearing Cone	1
19	Bearing Cone	2	51	O-Ring	1
20	3mm Plug	1	52	Pinion Seal	1
21	Cap Screw	2	53	Grease Fitting	1
22	Differential Case Cover	1	54	Seal Retainer Cartridge	1
23	Piston Inner Seal Ring	1	55	Grease Seal	1
24	Piston Inner Seal Backup Ring	1	56	Thrust Washer	1
25	Piston	1	57	V-Ring	1
26	Piston Outer Seal Ring	1	58	Wear Sleeve	1
27	Piston Outer Seal Backup Ring	1	59	Pinion Flange	1
28	Reaction Plate	7	60	O-Ring	1
29	Friction Plate	6	61	O-Ring Spacer	1
30	Side Gear Thrust Washer	2	62	Pinion Spacer	1
31	Side Gear	1	63	Pinion Shaft Nut	1
32	Pinion Gear Thrust Washer	4			

PLANETARY EXPLODED VIEW AND PARTS DESCRIPTION

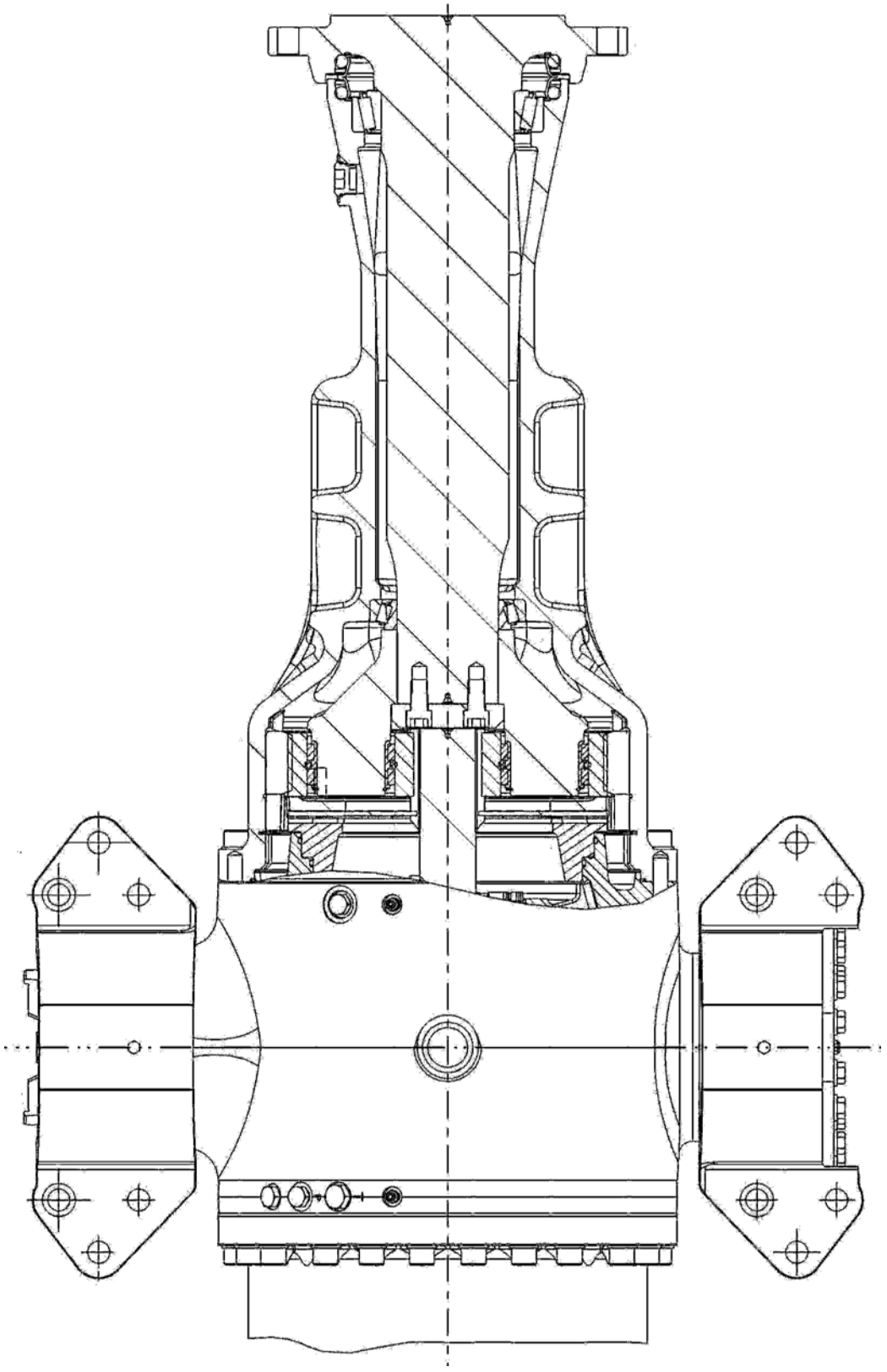


ITEM	DESCRIPTION	QTY
1	Planet Carrier	1
2	Bearing	4
3	Planet Gear	4
4	Planet Gear Snap Ring	4

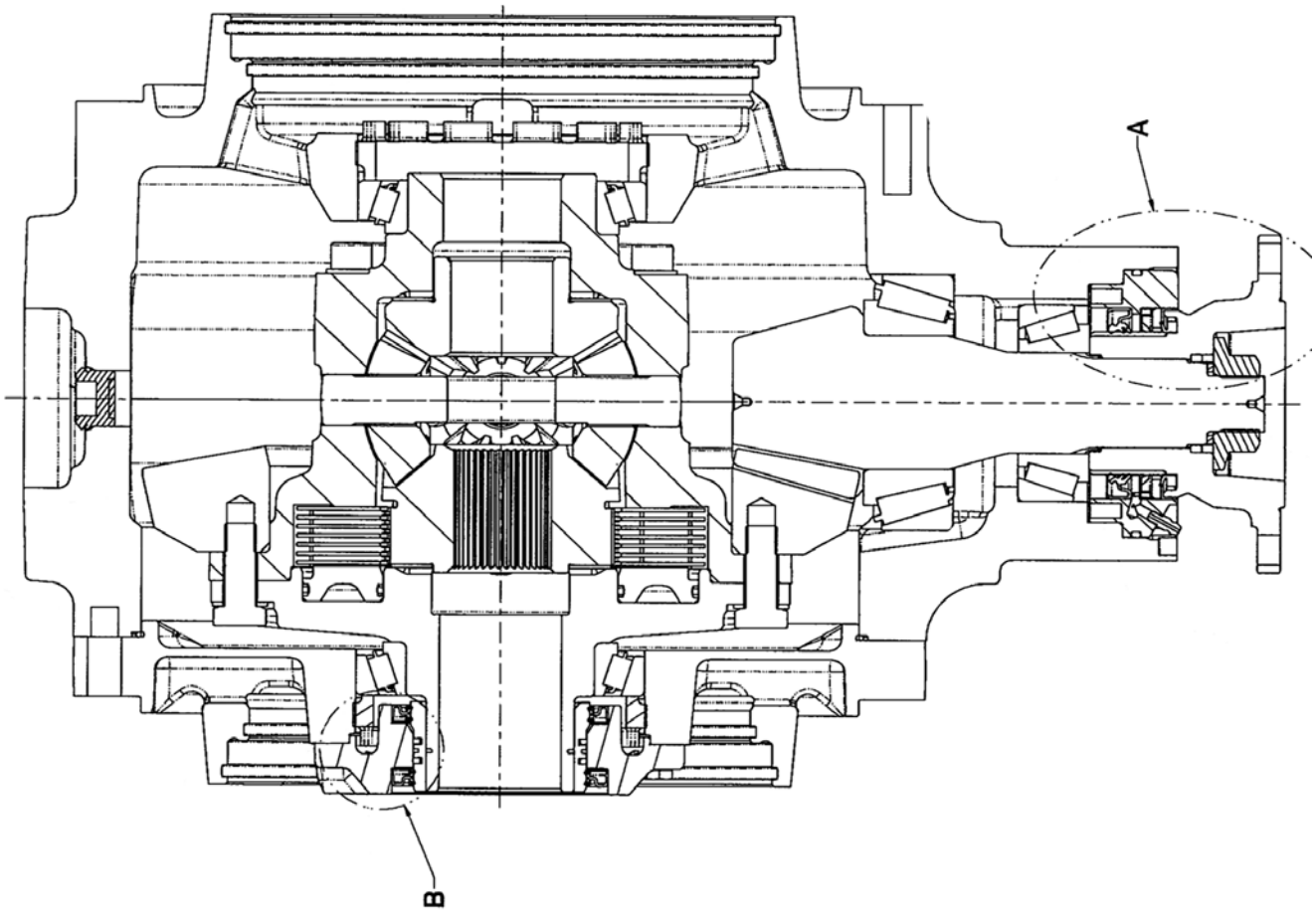
PAD MOUNT AXLE WITHOUT BRAKE
CROSS SECTION

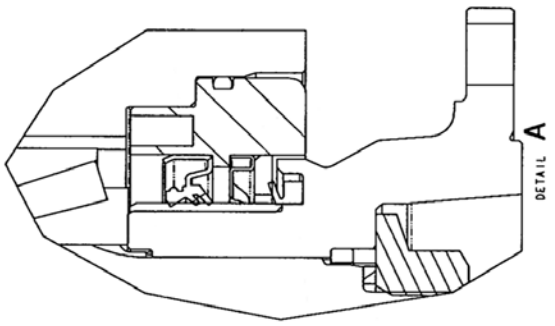


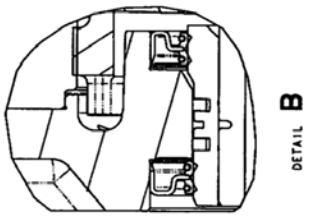
TRUNNION MOUNT AXLE WITH BRAKE CROSS SECTION



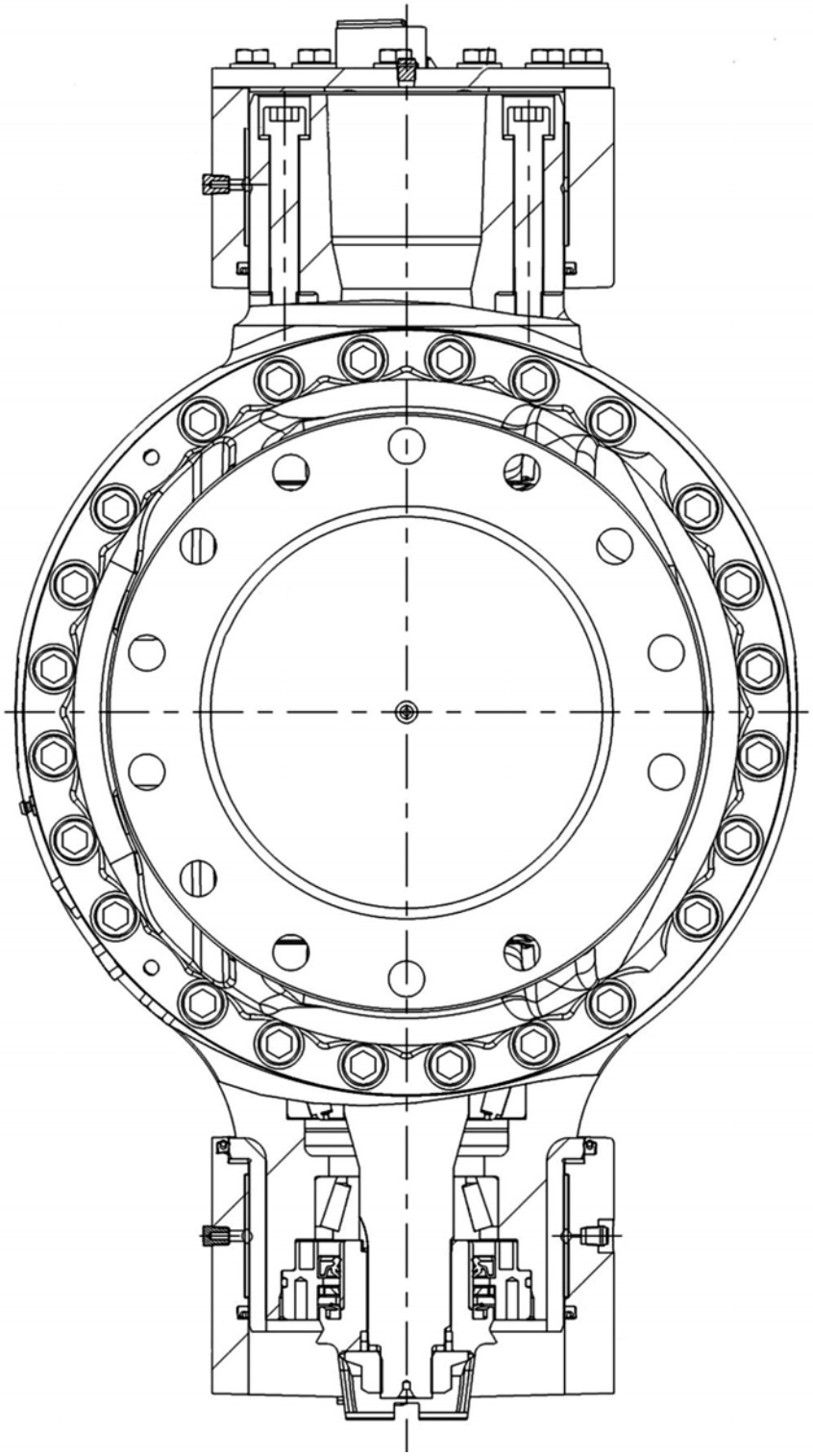
HYDRALOC DIFFERENTIAL
CROSS SECTION







TRUNNION MOUNTING
CROSS SECTION



HYDRALOC DIFFERENTIAL TEST INSTRUCTIONS

1. Air pressure test

Apply 83 kpa [12 psi] to pressure and tank ports simultaneously and allow stabilization period of 20 seconds minimum. Lock off pressure and measure decay in 10 seconds. Maximum allowable decay is 23 pa [.0033 psi] in 10 seconds. Alternate decay / period is .69 kpa [.1psi] per 5 minutes.

2. Hydraulic pressure test

Apply 4137 kpa [600 psi] to pressure port, with open tank line back to tank. Allow stabilization period of 20 seconds minimum and release. Reapply 4137 kpa [600 psi] and monitor fluid for a (1) one minute period. Fluid flow rate should not exceed 2.83 lpm [.75 gpm]

3. Functional test

Restrict movement of one side gear in differential so it will not rotate. Determine that differential is not locked by rotating input. Apply 10342 kpa [150 psi] to Hydraloc activation port. Differential should remain locked when a pinion input torque of 427 Nm [315 LBF/FT] is applied.

FACE SEAL INSTALLATION PROCEDURE

1 .	Clean trumpet arm and axle shaft with isopropyl alcohol, Quaker Solvo-Clean 68-0 or other approved evaporative solvent prior to installation of seal.
2 .	Keep original mated metal sealing rings as a set for axle shaft and trumpet arm (DO NOT INTERMIX METAL RINGS).
3 .	All parts of seal should be free of grease, oil, dirt and scale.
4 .	Sealing rings must be handled with care. Lapped sealing faces must not be damaged, scratched or contaminated with dirt or grease.
5 .	When installing the rubber toric on the seal ring, make sure that it is uniformly seated on the retaining lip and not twisted. Place the seal in the installation tool and locate assembly squarely against the housing. Use sudden and even pressure against the tool to push the toric under the retaining lip of the housing cavity. Insure the toric under the retaining lip of the tumpet arm cavity. Insure the toric is uniformly captured under the trumpet arm cavity retaining lip and is not twisted or pinched. The seal ring should be parallel to the housing within .040 [1.0 mm].
6 .	After installing the seal halves into the trumpet arm and axle shaft, wipe both metal sealing surfaces clean with lint free cloth. Then apply a coat of clean MS8 oil to the metal seal faces with a lint free applicator. Oil must not wet surfaces other than sealing faces.

RECOMMENDED LUBRICANTS FOR DRIVE AXLES

Recommendations: Extreme pressure gear lubricant is recommended for use in all drive-steer and rigid drive axles except where explicitly stated differently by Dana Off-Highway Products Engineering.

Mineral Based: Acceptable lubricants must meet **API GL-5/MT** or **MIL-PRF2105E** qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below. Limited slip designated GL-5 oil brands are preferred for quiet operating characteristics.

Universal Tractor Transmission Oils (UTTO Fluids): Acceptable lubricants must meet Dana MS266 or J. Deere J20C specifications. Use the highest viscosity grade for the ambient temperatures from the temperature chart below.

Synthetics: Synthetic lubricants are recommended providing they meet **API GL-5/MT-1** qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below. In general synthetic oils have a lower pressure viscosity response than mineral oil lubricants as the contact pressure between the gears increases. This produces a thickening of the mineral oil at the contact point. This increase in viscosity helps to maintain lubricant film thickness reducing the possibility of surface and spalling fatigue. Synthetic lubricants do not thicken as much under pressure unless specifically formulated to do so. Before using a synthetic lubricant in heavy applications, the customer must check with the lubricant supplier on the issue of high-pressure lubricant applications.

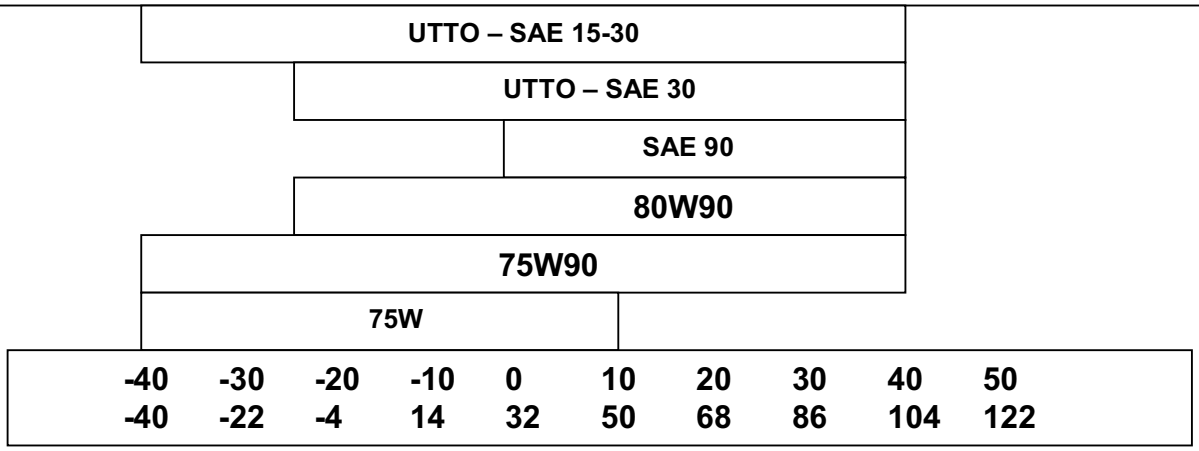
Normal Oil Change Intervals: Oil change intervals for mineral based lubricants in normal environmental and duty cycle conditions is 1000 hours in all off-highway applications and 10,000 miles in on-highway applications. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination. Judgement must be used to determine the required change intervals for extreme conditions.

Extended Oil Change Interval: Extended oil service may result when using synthetic lubricants. Appropriate change intervals must be determined for each application by measuring oxidation and wear metals over time to determine a base line. Wear metal analysis can provide useful information, but an axle should not be removed from service based solely on this analysis. Vehicles, which are prone to high levels of ingested water in the axle, or water as a result of condensation, should not use extended drain intervals.

Friction Modifiers: Friction modifiers may be used with the lubricant to reduce Posi-Torq (limited slip) differential noise or liquid cooled brake noise. If friction modifiers are used, follow instructions on **TSB 278E.**

The use of aftermarket lubricant additives other than those specified is not recommended and may reduce the life of the axle and void the warranty!

Viscosity Based on Prevailing Ambient Temperature



UNIVERSAL TRACTOR TRANSAXLE OILS (UTTO) RECOMMENDED FOR DANA DRIVE AXLES

Viscosity Class: SAE 30 / SAE 20-30 / SAE 15-30 Weights

MANUFACTURER	TRADE NAME
AMOCO	AMOCO1000
AQUIP	AQUIP Supertractor
Aral Lubricants GMBH, Bochum/D	Aral Fluid HGS
Avia Mineralol-AG, Munchen/D	Avia N56
BP	BP Eldoran UTH
BP Australia LTD, Silverwaters/AUS	Tractran TF-10
BP Oil International, London/GB	Tractran TF-9
BP Oil International, London/GB	Terrac Fluid 9
Caltrex Petroleum Corp., London/GB	Caltex Textran TDH Premium
Case New Holland	Hytrans
Castrol International, Swindon/GB	Castrol AGRI Powertrans
Cheveron	Chevron THF
Dea Mineralol AG, Hamburg/D	Deagear TDH OMV AG
ESSO Lubricants Europe, Brussel/B	ESSO Torque Fluid 56
Ford	Ford 134D UTF
Fuchs Dea Schnierstoffe, Mannhein/D	Titan Hydra J20C
Imperial Oil, Toronto/CDN	Torque Fluid N56
John Deere, Waterloo/USA	Deere Hydgard J20-C
John Deere Waterloo/USA	John Deere Hy-Gard (Europa)
Kuwait Petroleum, Europoor/NL	Q8 T 2000
Mobil Oil Company LTD, Coryton/GB	Mobilfluid 424
Mobil Oil Do Brasil, Sao Paulo/BR	Mobilfluid 424
Mobil	Mobil 424 UTF
Pakelo Motor Oil, San Bonifacio/I	Pakelo UTTO Fluid 4D
Panolin AG, Madetswil/CH	Panolin JD 303
Schwechat/A	OMV Austromatic IGB
Shell Aseol AG, Bern/CH	Aseol Multitrac 85W
Shell International, London/GB	Shell Donax TD 80W
Shell	Shell Donax TD
Texaco Belgium N.V., Brussels/B	Textran TDH Premium
Texaco	Texaco TDH
Total Fina	Trac Elf C4-1000

NOTES:

1) The above list of oils is not meant to be an all inclusive list of acceptable oils for use in Dana products.
2) It is the end users responsibility to select the best grades of oils available in the local area that provide proper viscosity and limited slip friction additives for long product life and noise free operation.

API GL5 CLASS GEAR LUBRICANTS WITH LIMITED SLIP ADDITIVES RECOMMENDED FOR DANA DRIVE AXLES

Viscosity Class: SAE 75W-90 / 80W-90 / 85W-90 / 90

MANUFACTURER	TRADE NAME
Addinol Mineralol GMBH, Krump/A/D	Addinol Getriebeol 85W90 LS
Agip Petroli Spa, Rom/l	Agip Rotra, MP/S
Aral Lubricants GMBH, Bochum/D	Aral Degol 3216
Avia Mineraloi-AG, Munchen/D	Avia Hypoid 90 LS
Baywa AG, Munchen/D	Baywa Getriebeol Hypoid LS 90
Blaser Swisslube, Hasie-Ruegsau/CH	Hypoid-Getriebeol LS
BP Oil International, London/GB	Frontal Getriebeol LS
BP Oil International, London/GB	Energear Limslip 90
Bucher AG, Langenthal/CH	Motorex Gear Oil LS
Calpam GMBH, Aschaffenburg/D	Calpam Gear Oil LS 90
Castrol International Swindon/GB	Castrol Hypoy LS
Castrol International Swindon/GB	Castrol LSX
Citgo USA	Citgo Premium LS 80W-90
Citgo USA	Citgo Synthetic 75W-90
ELF Lubricants, Paris/F	Antar BLS
ELF Lubricants, Paris/F	HRD EP GL
ELF Lubricants, Paris/F	Tranself Typ BLS
ELF Lubricants, North America	Gear Elf BlS90
Eller-Montan-Comp-Duisburg/D	Elimo-Hypoid LS
ESSO Lubricants Europe, Brussel/B	Esso Getriebeoel LSA 85W90
ESSO Imperial Oil NA	Esso GX LS 80W-90
ESSO Imperial Oil NA	Esso Extra LS 75W-90
Fina Europe, SA Brussel/B	Fina Pontonic LS
Fina Europe, SA Brussel/B	Fina Dynatrans LS
Fuchs Dea Schmierstoffe, Mannheim/D	Dealear LS
Fuchs Dea Schmierstoffe, Mannheim/D	Titan Gear LS90
Fuchs Dea Schmierstoffe, Mannheim/D	Dealear AWB
Furukawa Co LTD, Japan	Kyoseki FK Axle 80W90
Genol GMBH, Wiena/A	Genol Hypolube LS 90
Ginouves Georges SA, LA Farieda/F	York 798 LS
HAFA, Paris/F	Hypoid PA
Igol France, Paris/F	Igol Hypoid BPA
Indian Oil Corp, Faridabad/Ind	Servp Gear Super LS 90
Italiana Petroli, Genova A/I	IP Pontiax LS
Kompressol-OEL, Koin/D	Kompressol-Hypoid EW LS
Leprince + Siveke GMBH, Herford/D	Leprinxol LS
Liqui Moly GMBH, ULM/D	LM Hypoidgetriebeol GL-5 LS
Meguin GMBH, Saariouis/D	Megol Hypoidgetriebeol GL-5 LS
MIN.OL-Raffin Dollbergen, Uetza/D	Pennasol Sperrdiff-Getr.OL
Mobil Oil, Wedel/D	Mobilube LS
Mobil USA	Mobilube HD 80W-90 LS
Mol Hungarian Oil, Komarom/H	Carrier Hykomol LS
Motul AS, Valres Sur Marne/F	Motul 90 PA
Nova Stilmoll SPA, Modena/I	Gearing Wonder LS 85W90
Nova Stilmoll SPA, Modena/I	Gear G3 Lube Special Line 90
Oest G. Min.Ol-Werk, Freudenstadt/D	Getriebeol Hypoid LS 90
OMV AG. Schwechat/A	OMV Gear Oil LS
Orfy International, Vieux-Thann/F	Orfy Tucana LS
Pakelo Motor Oil, San Bonifacio/I	Pakelo Universal Gear EP/LS
Panolin AG, Madetswil/CH	Panolin Super Duty LS
Pennzoil NA	4096 80W-90LS
Quaker State NA	HP 80W-90
Raiffeisen HG Nord AG, Hannover/D	HG Getriebeol LS 90
Repsol Distribucion SA, Madrid/E	S EP Autoblocante
SAEL Madrid/E	Gulf LS Rear Axle Oil
Schmierstoffraffinerie Saizbergen/D	Wintershall Wiolin RSH
Shell Aseol AG, Bern/CH	Aseol Topress LS
Shell International London/GB	Shell Getriebeol 90 LS
SK Corporation, Eeoul/Korea	SK G-LS 80W/90 Gear Oil
Texaco Belgium N.V. Brussels/B	Geartex LS
Texaco USA	Mutligear EP 80W-90
Total Raffinage Distr. Paris/F	Total Transmission DA
Turbotank Bosche+Bodeker, Bremen/D	Turbo Getriebeol LS
Unil Deutschland GMBH, Bremen/D	Unil Gear AB EP
Unil Opal, Rueil Maimaison/F	Unil Opal Gear AB-EP
Veedol International, Swindon/GB	Veedol Multigear L
Yacco SA, St Pierre-LES-Elbeuf/F	Yahypo BN 90

NOTES: 1) The above list of oils is not meant to be an all inclusive list of acceptable oils for use in Dana products. **2)** It is the end users responsibility to select the best grades of oils available in the local area that provide proper viscosity and limited slip friction additives for long product life and noise free operation. **3)** Intermixing of GL5 oils with UTTO GL4 oils is not recommended as they are not compatible.

BEARING HEATING AND FREEZING GUIDELINES

Bearings often must be cooled or heated to aid in assembly or removal. Since temperature extremes can cause permanent bearing metallurgical damage, it is important to take proper precautions and use correct methods when heating and cooling bearings.

Cups that are to be assembled in hubs or housings with a press fit may be shrunk in a deep freeze unit. Standard class bearings should not be cooled below -65° F (-54° C). In addition to cooling the bearing cup, in some instances it may be necessary to heat the housing.

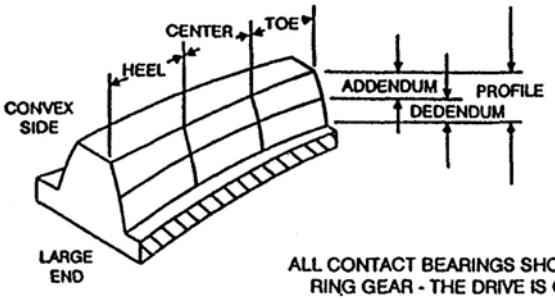
To control temperature, is best to use a thermostat along with a freezer unit or a properly calibrated thermometer. If a suitable freezer or thermometer is not available, your Timken service representative can suggest liquid combinations that freeze the bearing cup at the optimal temperatures. Regardless of the method, check the cup's final seating against the housing shoulder with feeler gauges.

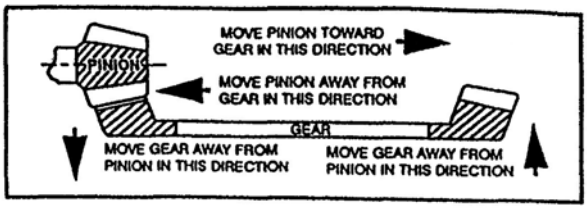
Take extreme care that standard product bearings are never heated above 149° C [300° F]. If bearings are heated above this temperature, their metallurgical structure may soften, rendering them unsuitable for use.

There are a number of recommended methods for heating bearings. Electric ovens or electrically heated oil baths may be used, but only when accompanied by proper thermostatic control. If you use a hot plate to heat the oil, never rest bearings directly on the bottom of the pan. Instead, protect bearings from the heat source with a simple wire screen holder or similar device.

Use heat-resistant gloves to handle heated cones. Hold the hot cone solid against the cold shoulder on the shaft until the cone grabs on to the shaft. The hot cone will pull away from the cold shoulder unless it is held in position. Use .002 [.05 mm] feeler gages to make sure the cone is fully seated against the shoulder after the parts are cooled. Many loose bearing settings (excessive end play) are caused by an unseated cone working back against the shoulder in service.

LEFT HAND SPIRAL
SPIRAL BEVEL AND HYPOID TOOTH BEARING CHART





ALL CONTACT BEARINGS SHOWN BELOW ARE ON <u>LEFT HAND</u> SPIRAL RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

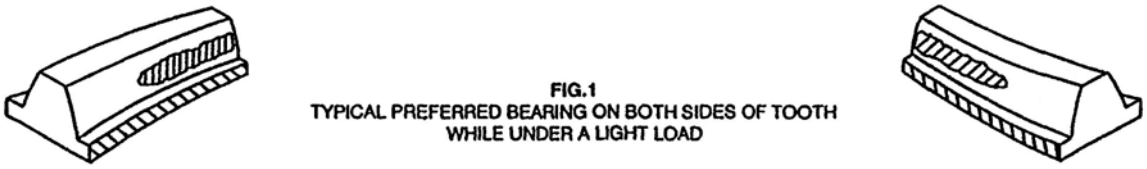


FIG.1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

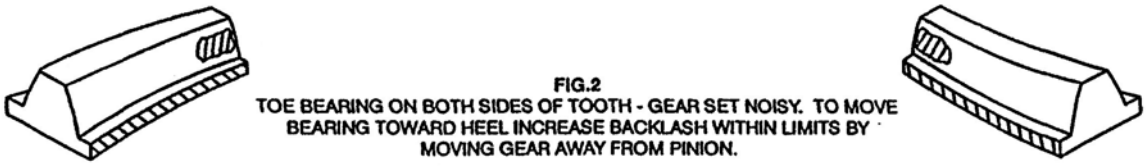


FIG.2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

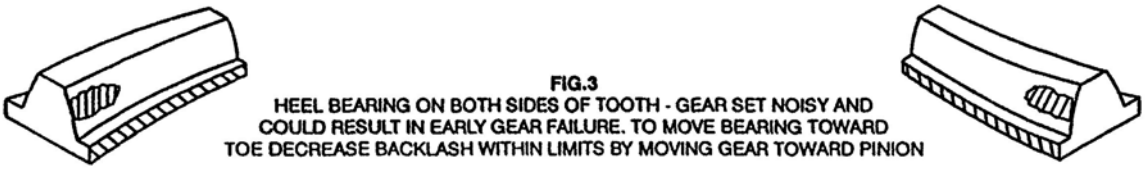


FIG.3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

FIG.4
LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE)

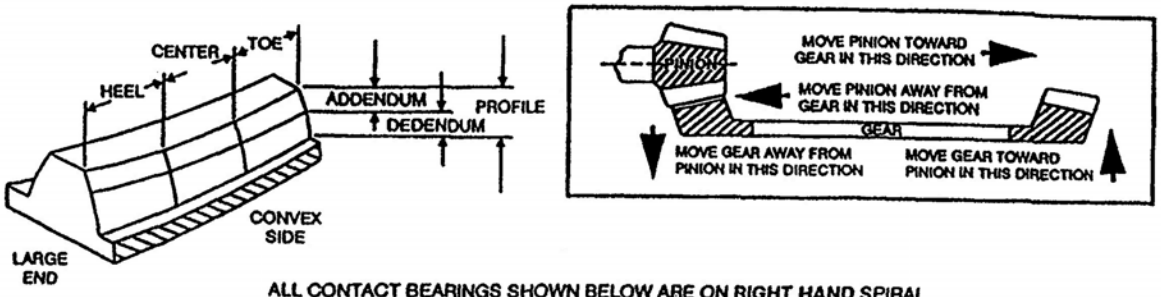
FIG.5
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION TOWARD GEAR (DECREASE MOUNTING DISTANCE)

BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

RIGHT HAND SPIRAL

SPIRAL BEVEL AND HYPOID TOOTH BEARING CHART



ALL CONTACT BEARINGS SHOWN BELOW ARE ON RIGHT HAND SPIRAL RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

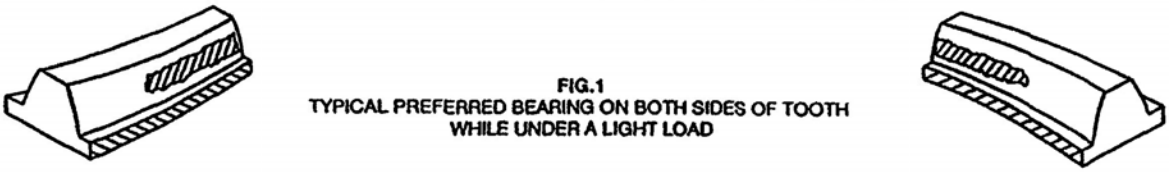


FIG.1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

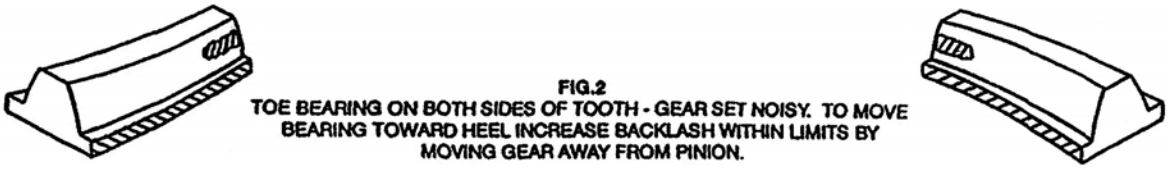


FIG.2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

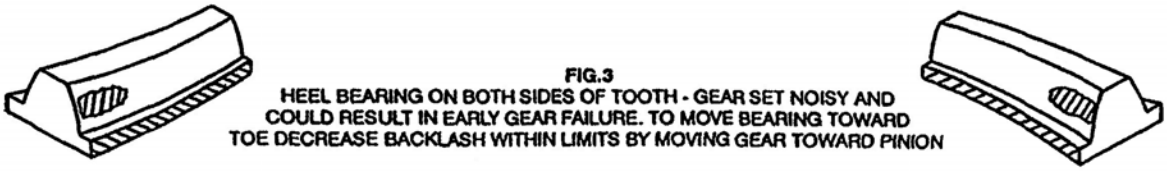


FIG.3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

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BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated slowly until parts are thoroughly cleaned of all old lubricants and foreign materials.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

BEARINGS

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture free compressed air. Be careful to direct air stream across bearings to avoid spinning. Bearings may be rotated slowly by hand to facilitate the drying process.

TRUMPET ARMS, COVERS AND CAPS

Clean interior and exterior of trumpet arms, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid skin rashes and inhalation of vapors when using alkali cleaners. Thoroughly dry all parts cleaned immediately by using moisture-free compressed air or soft lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

BEARINGS

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lint free cloth or paper to protect them until installed.

OIL SEALS, GASKETS AND RETAINING RINGS

Replacement of spring loaded oil seals, gaskets, and snap rings is more economical when unit is disassembled than to risk premature overhaul to replace these parts at a future time. Loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing member should be handled carefully, particularly when being installed. Cutting, scratching or curling under lip of seal seriously impairs its efficiency. At reassembly, lubricate lips of oil seals with Multipurpose Lithium grease "Grade 2".

CLEANING AND INSPECTION - CONT.

GEARS AND SHAFTS

If Magna-Flux or a dye penetrant process is available use process to check parts. Examine teeth and the ground/polished surfaces of all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scoring. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone stone. Inspect shafts to make certain they are not sprung, bent or have twisted splines.

TRUMPET ARMS, COVERS AND CAPS

Inspect trumpet arms and covers to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc. are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which can cause oil leaks or failures.

FASTENER TORQUE CHART

STANDARD FASTENERS				
Lubricated and Plated Bolts, CapScrews, and Studs				
	Grade 5		Grade 8	
	3 Radial Dashes On Bolt Head		6 Radial Dashes On Bolt Head	
Size	LBF/FT	[Nm]	LBF/FT	[Nm]
1/4-20	10	14	11	15
1/4-28	11	15	13	18
5/16-18	16	22	30	41
5/16-24	20	27	32	43
3/8-16	25	34	36	49
3/8-24	29	39	41	56
7/16-14	41	56	57	77
7/16-20	45	61	64	87
1/2-13	63	85	88	119
1/2-20	70	95	99	134
9/16-12	90	122	127	172
9/16-18	100	136	141	191
5/8-11	124	168	175	237
5/8-18	141	191	198	268
3/4-10	220	298	310	420
3/4-16	245	332	347	470

METRIC FASTENERS						
Lubricated and Plated Bolts, CapScrews, and Studs						
	Class 8.8		Class 10.9		Class 12.9	
	8.8 on Bolt Head		10.9 on Bolt Head		12.9 on Bolt Head	
Size	LBF/FT	[Nm]	LBF/FT	[Nm]	LBF/FT	[Nm]
M4	2.2	3	3.2	4.4	7.4	10
M5	4.4	5.9	6.4	8.7	7.4	10
M6	7.4	10	11	15	13	18
M8	18	25	26	36	19	26
M10	36	49	51	72	50	68
M12	63	85	92	125	76	103
M14	100	135	147	200	142	193
M16	155	210	229	310	222	301
M18	221	300	317	430	369	500
M20	313	425	450	610	432	586
M22	428	580	605	820	516	700
M24	538	730	774	1050	748	1014

PLUG TORQUE CHART

PIPE PLUGS		
Size (NPTF)	LBF/FT	[Nm]
1/16-27	7	9
1/8-27	10	14
1/4-18	20	27
3/8-18	30	41
1/2-14	35	47
3/4-14	45	61
1-11 1/2	55	75
1 1/4-11 1/2	65	88

Trumpet Arm Removal

Figure 1
Remove (2) socket head screws and washers 180° apart from trumpet arm.

Figure 2
Install (2) alignment pins in place of socket head screws and washers.

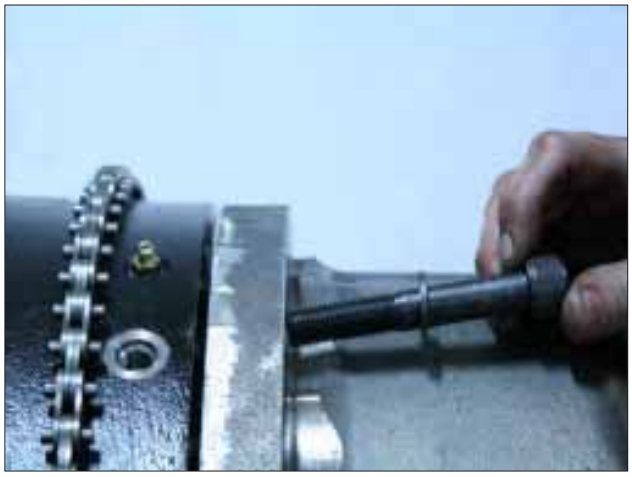


Figure 3
With trumpet arm securely supported, remove remainder of socket head screws and washers.

Figure 4
Carefully separate trumpet arm from differential carrier.
NOTE: Insure axle is secured to prevent injury when trumpet arm is removed.

Trumpet Arm, Brake and Planetary Disassembly

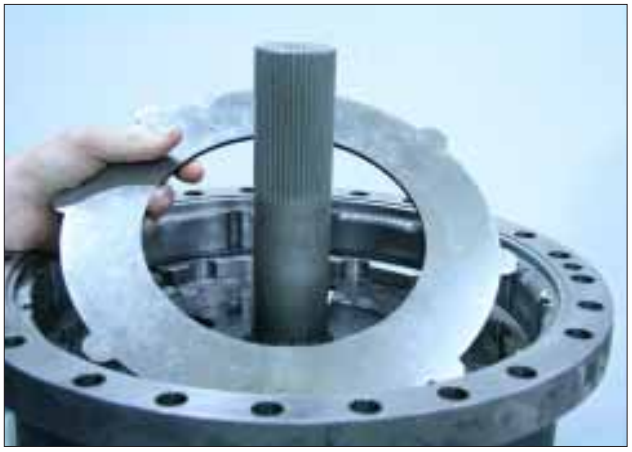


Figure 5
Remove reaction plate.

Figure 6
Remove friction plate.
NOTE: Measure friction disc for wear.
The minimum thickness is 4.57 mm [.180”].

Figure 7
Remove sun gear. **NOTE**: If axle does not have brakes proceed to ***figure 11*.**

Figure 8
Remove (4) brake piston return springs.

Figure 9
Remove brake abutment plate snap ring.

Figure 10
Remove abutment plate.

Figure 11
Remove internal ring gear snap ring.
NOTE: Does not apply to axle with brakes.

Figure 12
Remove (12) dowel pins.
NOTE: A magnet is helpful in this procedure.

Figure 13
Remove internal ring gear.
NOTE: If not replacing planet gear and bearing assemblies skip ***figures 14, 15 & 17*** and proceed to ***figure 16 & 18*** to remove planetary and clamp plate as a complete assembly.

Figure 14
Remove (4) planet gear and bearing snap rings.

Figure 15
Using appropriate puller remove (4) planet gear and bearing assemblies.

Figure 16
Remove (4) socket head screws.

Figure 17
Remove clamp plate and shims.

Figure 18
Remove planet carrier.

Figure 19
Install a pusher tool as shown and press or use a soft bar and drive axle shaft out of the inner wheel bearing cone.
NOTE: Reference pressing tool in ***figure 20***.
IMPORTANT: Support flange end of axle shaft as shown in ***figure 21*** during this procedure.

Figure 20
Typical pusher tool which may be fabricated to remove axle shaft.

Figure 21
Remove axle shaft. **NOTE:** Bar inserted in bottom stud hole, as shown, will assist in positioning axle shaft during disassembly and reassembly procedures.

Figure 22
Remove inner wheel bearing cone.

Figure 23
Remove face seal. **NOTE:** If reusing seals keep original mated steel sealing rings as a set. Reference face seal installation instructions on *page 19*.

Figure 24
Cut wheel bearing cone cage and remove bearing rollers. Using a die grinder, as shown, carefully cut the inner race of the wheel bearing cone.
IMPORTANT: Be careful to not damage axle shaft.

Figure 25
Using a screwdriver expand inner race and remove.

Figure 28
Remove outer wheel bearing cup.

Figure 26
Remove face seal from trumpet arm.

Figure 29
Drive inner wheel bearing cup from trumpet arm and remove. Reference ***figure 27***.
Repeat process for opposite trumpet arm.

Figure 27
Drive outer wheel bearing cup from trumpet arm.

Figure 30
Remove seal ring from differential carrier housing.
Remove (2) alignment pins.

Figure 31
Remove brake piston.
NOTE: Procedures in ***figures 31&32*** do not apply to axles without brakes.

Figure 32
Remove (2) brake piston seals and (2) backup rings.
Repeat process in ***figures 30-32*** for opposite side.

Hydraloc Differential Disassembly

Figure 33

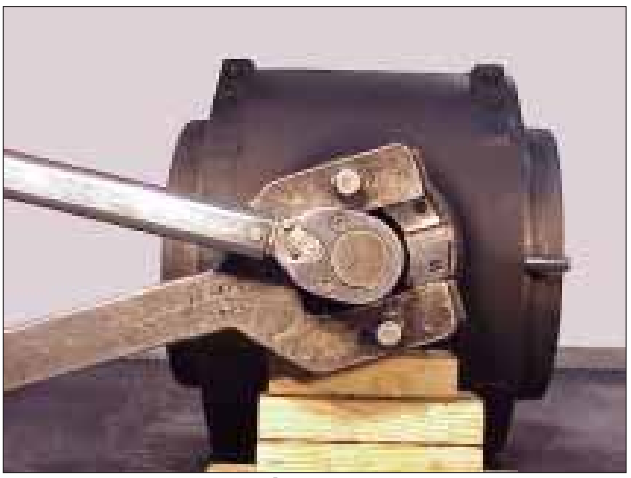


Figure 36
Loosen pinion nut.

Figure 34
Position unit on bench, support with blocks as shown.

Figure 37
Remove pinion nut.

Drive Flange V-Ring and Wear Sleeve Removal

Figure 35
Heat pinion nut to release thread locking compound.

Figure 38
Remove pinion spacer, seal ring and o-ring.

Figure 39
Remove flange.

Figure 40
Remove v-ring seal from flange.

Figure 41
Mark flange wear sleeve in three equally spaced locations as shown across the full width of sleeve.

Figure 42
Grind the cutting edge of a chisel to a radius as shown.

Figure 43
Use rounded tip chisel to expand and remove wear sleeve by striking evenly across the width of the sleeve in the three marked locations. **IMPORTANT:** Do not cut through wear sleeve as damage to the flange will occur.

Pinion Seal Retainer Cartridge and Seal Removal

Figure 44
Install (2) M8 screws and flat washers in puller holes.

Figure 45
Remove seal retainer cartridge.

Figure 46
Remove pinion seal from cartridge.

Figure 47
Remove grease seal and thrust washer.

Figure 48
Remove o-ring.

Figure 49
Remove grease fitting.

Differential Retainer and Adjuster Removal

Figure 50
Remove (2) differential adjusting nut cap screws and lock.

Figure 51
Remove adjusting nut lock socket head screw.

Figure 54
Remove (2) seal retainer seal rings.

Figure 52
Remove (4) seal retainer cap screws.

Figure 55
Remove seal retainer inner oil seal.

Figure 53
Remove seal retainer.

Figure 56
Remove seal retainer outer oil seal.

Figure 57
Remove (4) differential retainer cap screws.

Figure 60
Install (2) M8 eye bolts.

Figure 58
Loosen differential adjusting nut.
Reference tool drawing on *page 92*.

Figure 61
Install (2) chain clevises, attach hoist.

Figure 59
Remove differential adjusting nut.

Figure 62
Remove differential retainer.

Differential Assembly Removal

Figure 63
Remove (2) piston rings.

Figure 64
Remove (2) ring gear mounting cap screws and washers 180° from each other.

Figure 65
Install (2) M16 eye bolts.

Figure 66
Attach hoist and remove differential assembly and ring gear.

Ring Gear Removal

Figure 67
Remove (14) ring gear cap screws and washers.

Figure 68
Position wood blocks or equivalent under ring gear and tap with mallet to remove from differential body. Reference ***figure 69.***

Figure 69
Wood blocks or equivalent placed under ring gear to prevent ring gear damage.

Differential Body Disassembly

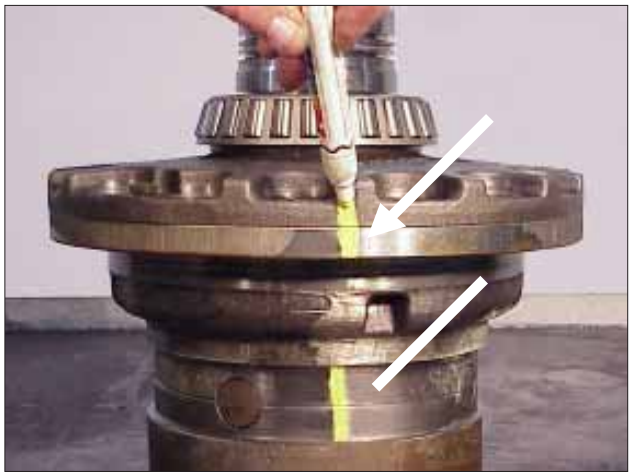


Figure 70
Mark case as shown in (2) places for proper alignment during reassembly.

Figure 71
Remove (2) cap screws.

Figure 72
Remove case flanged half.

Figure 73
Remove side gear thrust washer.

Figure 74
Remove reaction and friction discs.

Figure 75
Remove side gear.

Figure 78
Remove side gear thrust washer.

Figure 76
Remove (12) socket head screws and washers.

Figure 79
Remove side gear.

Figure 77
Remove differential cap.

Figure 80
Remove spider with pinion gears and thrust washers.

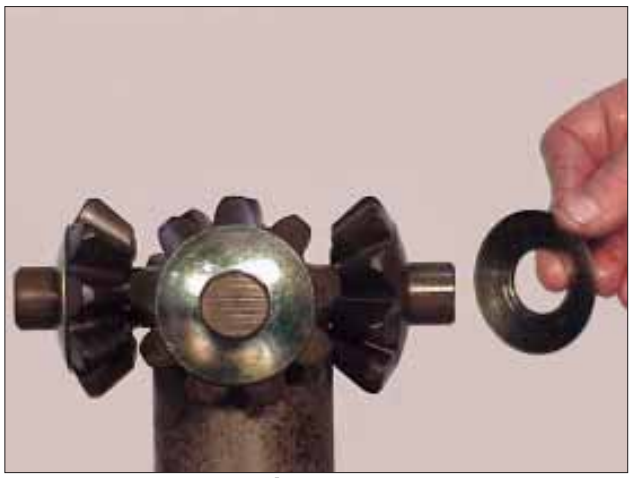


Figure 81
Remove (4) pinion gear thrust washers.

Figure 82
Remove (4) pinion gears.

Figure 83
Apply heat and remove differential bearing cone. Reference bearing heating and freezing guidelines on *page 23.*

Figure 84
Apply heat and remove wear sleeve.

Figure 85
Apply heat and remove differential bearing cone.

Piston Removal

Figure 86
Position differential flange half on bench as shown. Use compressed air to push piston out of bore.

Figure 87
Remove piston.

Figure 88
Remove outer piston seal and back up ring.

Figure 89
Remove inner piston seal and back up ring.

Pinion Removal

Figure 90
Install pinion nut to protect threads and tap pinion through outer bearing cone.

Figure 91
Remove pinion assembly. Remove pinion nut.

Figure 92
Remove pinion inner bearing cone.

Figure 93
Remove pinion outer bearing cone.

Figure 94
Remove differential bearing adjusting nut and cup.

Figure 95
Remove pinion inner bearing cup and shim.

Figure 96
Remove pinion outer bearing cup.

Figure 97
Remove bleeder screw and seat.

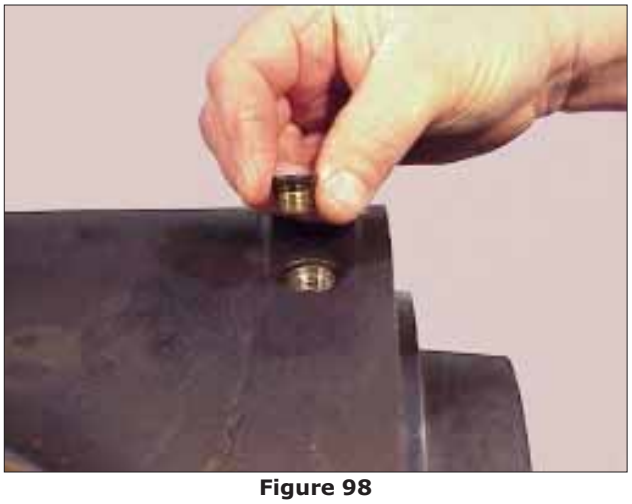


Figure 98
Remove plug and o-ring.

Hydraloc Differential Reassembly

Figure 99
Remove plug and o-ring.

Figure 100
Apply thin, continuous coat of Loctite 620 or equivalent to wear sleeve mounting surface.

Figure 101
Apply thin, continuous coat of Loctite 620 or equivalent to inside diameter of wear sleeve.

Figure 102
Install wear sleeve on flange half.
NOTE: End of sleeve should be flush with end of journal.
Reference tool drawing on *page 93.*

Figure 103
Use compressed air to blow excess sealant from oil passage.

Figure 106
Lubricate spider with axle lubricant and install (4) pinion gears.

Figure 104
Clean cured thread locking compound from tapped holes with M14x2 tap. Remove remaining residue from holes.

Figure 107
Lubricate and install (4) thrust washers.

Figure 105
Heat and install differential bearing cone on cap half. Reference bearing heating and freezing guidelines on *page 23.*

Figure 108
Install assembly in clutch housing.

Figure 109
Install side gear.

Figure 110
Lubricate side gear.

Figure 111
Install thrust washer.

Figure 112
Lubricate thrust washer.

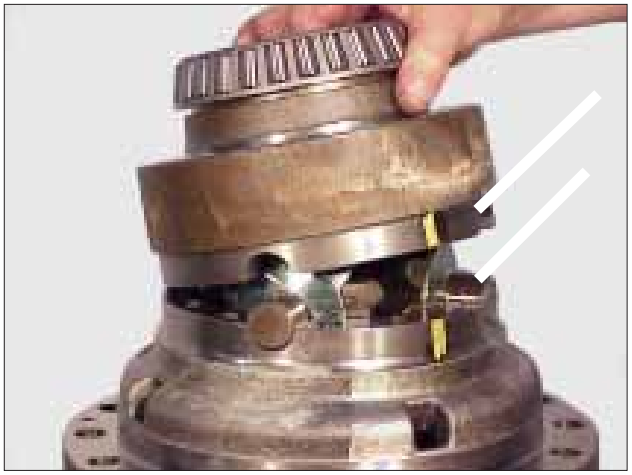


Figure 113
Install differential cap.
NOTE: Align identification marks.

Figure 114
Install (12) socket head screws and washers.

Figure 115
Tighten screws in a star pattern to 183-202 Nm [135-149 LBF/FT].

Figure 118
Lubricate both sides of friction disc and install. Alternately install remaining reaction and friction discs.
NOTE: Align lube grooves with each other.

Figure 116
Install side gear.

Figure 119
Lubricate side gear.

Figure 117
Lubricate both sides of reaction disc and install.

Figure 120
Install thrust washer.

Figure 121
Install piston outer seal back up ring.

Figure 124
Install piston inner seal ring.
NOTE: Back up ring must be installed prior to seal ring.

Figure 122
Install piston outer seal ring.
NOTE: Back up ring must be installed prior to seal ring.

Figure 125
Lubricate piston seals and bore.
Position piston in bore.

Figure 123
Install piston inner seal back up ring.

Figure 126
Carefully tap piston into bore evenly with mallet.

Figure 127
Install differential flange half.
NOTE: Align identification marks as shown.

Figure 128
Apply Loctite 262 or equivalent to
(2) cap screws and install.

Figure 129
Tighten (2) cap screws to
24-27 Nm [18-20 LBF/FT].

Ring Gear Installation

Figure 130
Clean foreign material and/or cured thread
locking compound from holes with M16x2 tap.
Remove remaining residue from holes.

Figure 131
Use hone stone or file to remove
nicks or burrs from mounting face.
NOTE: Be sure to remove all abrasive residue.

Figure 132
Use hone stone or file to remove
nicks or burrs from mounting face.
NOTE: Be sure to remove all abrasive residue.

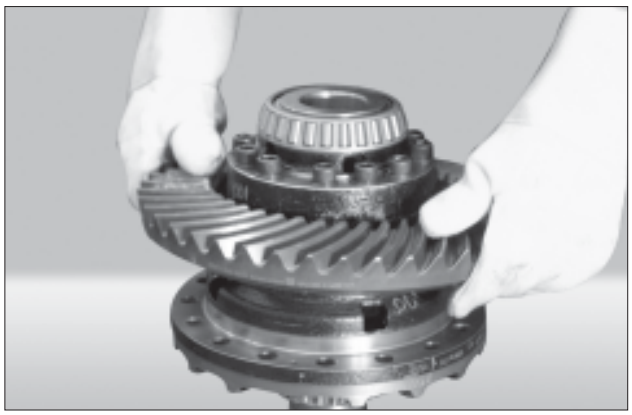


Figure 133
Heat ring gear to 93-100°C [200-212°F] and Install.
Caution: Use gloves to avoid injury.

Figure 134
Temporarily install (2) ring gear mounting screws 180° apart and tighten to 135 Nm [100 LBF/FT].
Allow assembly to cool before installing additional screws.
IMPORTANT: Using a .05 mm [.002”] feeler gauge check several locations around ring gear to be sure there is no gap between the ring gear and differential body mounting faces.
NOTE: Assembly is shown with ring gear down for clarity.
This procedure should be performed with assembly in same position as shown in ***figure 133***.

Figure 135
Heat and install differential bearing cone. Reference bearing heating and freezing guidelines on *page 23.*

Pinion Installation and Adjustment

Figure 136
Locate ring gear mounting distance dimension located in this area and record.

Figure 137
Number as it appears in ***figure 136***.

Figure 138
Locate ring gear mounting distance dimension on ring gear and record.

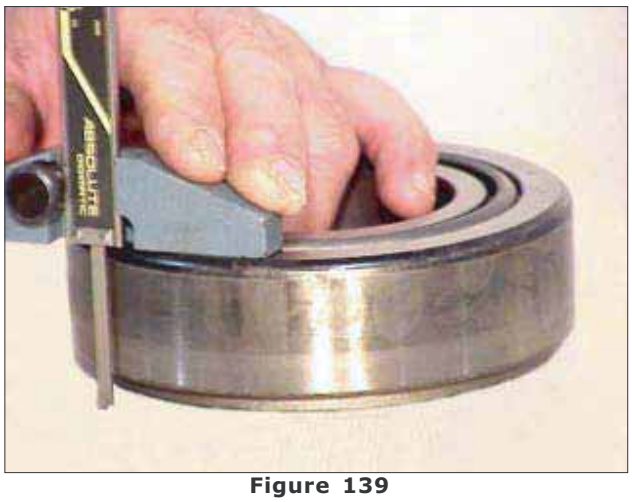


Figure 139
Measure height of pinion inner bearing cup and cone and record. Calculate ring and pinion mounting distance shim as follows:

Example

Number from housing	232.560 mm [9.1559″]
Number from ring gear	- 186.106 mm [7.3270″]
Bearing height	- 45.974 mm [1.8100″]
	- .127 mm [.0050″]
Shim thickness required	.353 mm [.0139″]

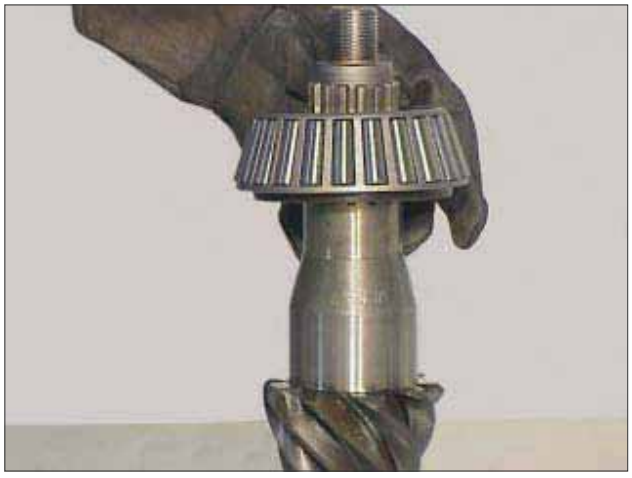


Figure 140
Heat and install pinion inner bearing cone. Reference bearing heating and freezing guidelines on *page 24.*

Figure 141
Install pinion outer bearing cup.

Figure 142
Install mounting distance shim as determined in ***figure 139.***

Figure 143
Freeze and install pinion inner bearing cup. Reference bearing heating and freezing guidelines on *page 24.*

Figure 144
Check for proper seating of pinion inner and outer bearing cups. Reference bearing heating and freezing guidelines on *page 23.*

Figure 145
Lubricate pinion inner bearing cone.

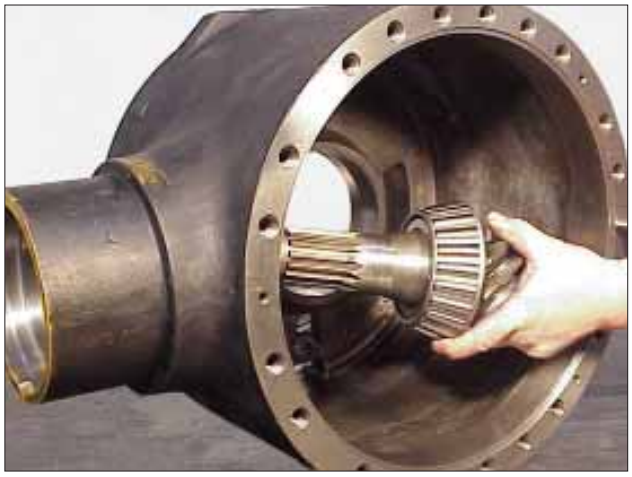


Figure 146
Install pinion.

Figure 147
Lubricate pinion outer bearing cone.

Figure 148
Heat and install pinion outer bearing cone.

Figure 149
Install flange.

Figure 150
Install pinion spacer.

Figure 151
Install pinion nut and tighten to
1261-1396 Nm [930-1030 LBF/FT].

Figure 152
Check pinion bearing rolling resistance and record.

Pinion rolling resistance recorded in ***figure 152***
should be 1.13-3.95 Nm [10-35 LBF/IN].

If within specification remove nut, spacer and flange.

If not within specification repeat steps in ***figures 150-152*** making appropriate spacer substitution.

If rolling resistance is too low reduce spacer thickness. If rolling resistance is too high increase spacer thickness.

Figure 153

Pinion Seal Installation

Figure 154
Apply thin continuous coat of Loctite 620 or equivalent to pinion seal bore.

Figure 155
Using appropriate driver, install pinion seal.
Reference tool drawing on *page 89*.

Figure 156
Apply thin continuous coat of Loctite 620 or equivalent to grease seal bore.

Figure 159
Apply Loctite 620 or equivalent to threads and install grease fitting.

Figure 157
Using appropriate driver install grease seal and thrust washer. Reference tool drawing on *page 88.*

Figure 160
Apply light coat of grease to sealing ring sealing surface in carrier bore.

Figure 158
Install o-ring. Apply thin continuous coat of Loctite 620 or equivalent to pilot dia. of retainer as indicated.

Figure 161
Apply grease to thrust washer face and seal lips.

Figure 162
Position seal retainer in bore.

Figure 163
Index retainer so eye brows align.

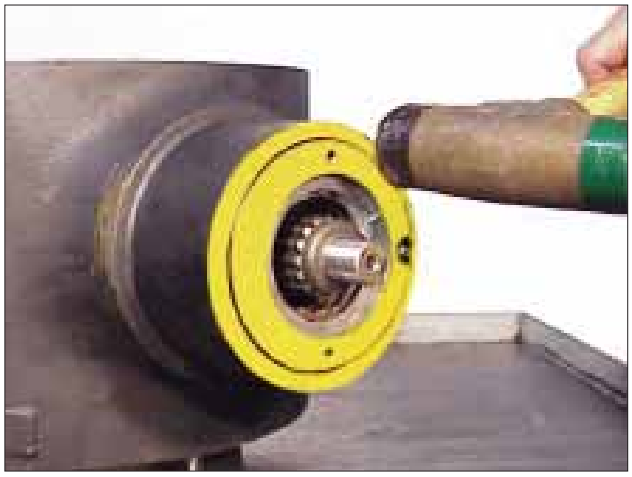


Figure 164
Carefully tap retainer with a soft mallet evenly around diameter to install.

Wear Sleeve Installation

Figure 165
Apply continuous coat of Loctite 620 or equivalent to wear sleeve I.D.

Figure 166
Using appropriate driver install wear sleeve.
Reference tool drawing on *page 94.*

Pinion Flange Installation

Figure 167
Install v-ring seal.

Figure 168
Install input flange.

Figure 169
Install o-ring and o-ring spacer.

Figure 170
Install pinion spacer identified in ***figure 153***.

Figure 171
Apply Loctite 262 or equivalent to pinion nut threads.

Figure 172
Tighten pinion nut to 1261-1396 Nm [930-1030 LBF/FT]. Reference ***Figure 163*** for fitting location and apply grease to input seals until it comes out from around the v-ring lip.
NOTE: Seals should be greased at every normal servicing interval. Machines in conditions where the axle routinely becomes submerged should be serviced more often.

Carrier Housing Assembly

Figure 173
Install differential bearing cup.

Figure 174
Install differential bearing adjusting nut.

Differential Assembly Installation

Figure 175
Paint 5 to 6 ring gear teeth with contact checking compound.

Figure 176
Install differential assembly in housing.

Figure 177
Lock or hold pinion shaft from turning.

Figure 178
Remove (1) of (2) ring gear cap screws and mark head of remaining screw for identification purposes.

Figure 179
Apply Loctite 262 or equivalent to (15) ring gear mounting cap screws and install with washers. Run down but do not tighten. **IMPORTANT: Perform the procedures shown in *figures 179-181* in a timely manner before the Loctite begins to cure.**

Figure 180
Remove marked cap screw, apply Loctite 262 or equivalent and install with washer.

Figure 181
Tighten (16) ring gear mounting cap screws in a star pattern to 286-316 Nm [211-233 LBF/FT]. Using a brass bar or equivalent sharply shock assembly in several locations around the bolt circle. Immediately retighten all cap screws in a star pattern to 286-316 Nm [211-233 LBF/FT].

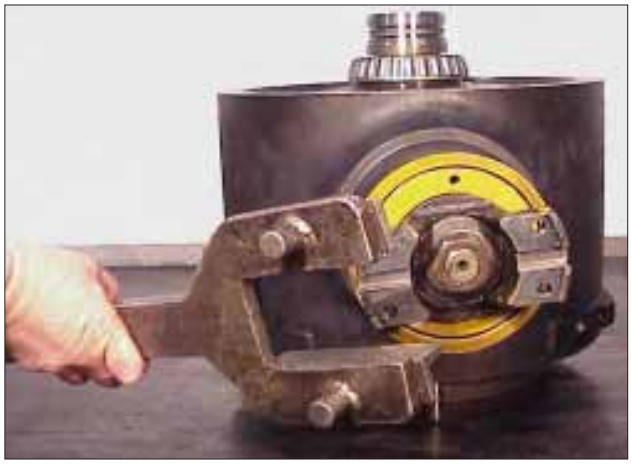


Figure 182
Release pinion shaft.

Differential Retainer Installation

Figure 183
Install differential bearing cup.

Figure 184
Install differential retainer o-ring and lubricate with grease.

Figure 185
Install differential bearing adjusting nut.

Figure 186
Lubricate differential bearing cone with axle lubricant.

Figure 187
Install (2) piston rings. Coat rings with grease and center in grooves.

Figure 188
Install (2) alignment pins located 180° apart.

Figure 189
Install differential retainer.

Figure 190
Install (4) retainer cap screws and tighten to 24-27 Nm [18-20 LBF/FT].

Backlash and Contact Pattern Setup and Adjustment

Figure 191
Tighten differential adjusting nuts to a minimum of 41 Nm [30 LBF/FT]. Rotate pinion back and forth while performing this step to assure that detectable backlash exists and ring gear is not being forced into pinion gear. Reference tool drawing on *page 92.*

Figure 192
Set up magnetic base dial indicator as shown to measure ring and pinion back lash.

With ring gear being held stationary, rock the pinion flange back and forth gently while watching the reading on dial indicator.
Backlash specifications are as follows:
37R 4.556 ratio with 6C-TP Flange .46-.74 mm [.018-.029”]
37R 4.556 ratio with 7C-TP Flange .48-.79 mm [.019-.031”]
37R 5.125 ratio with 6C-TP Flange .56-.89 mm [.022-.035”]
37R 5.125 ratio with 7C-TP Flange .58-.94 mm [.023-.037”]

If the readings are out of specification, move the differential adjusting nuts inward or outward together. **IMPORTANT:** Recheck differential bearing preload after the proper backlash reading is achieved. ***Refer to figure 191.***

Figure 193

Figure 194
Install differential adjusting nut lock. **IMPORTANT: Advance** adjusting nut if necessary to line up mounting holes. **Do Not** loosen/back off nut.

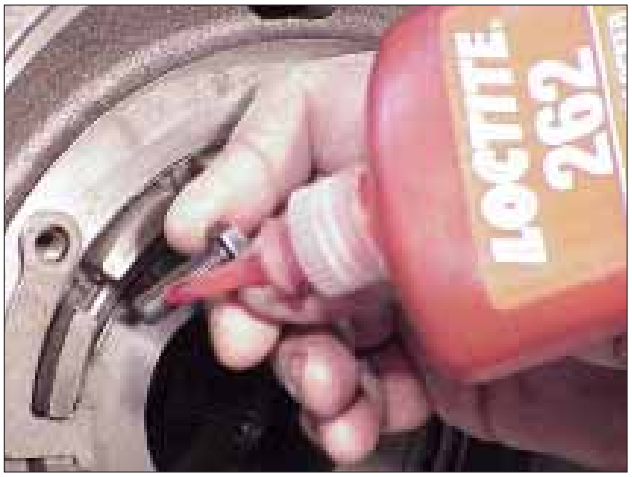


Figure 195
Apply Loctite 262 or equivalent to (2) nut lock cap screws and install. Tighten to 24-27 Nm [18-20 LBF/FT].

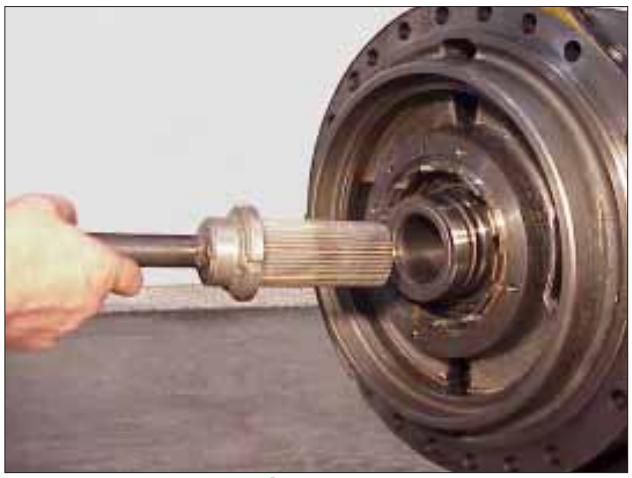


Figure 196
Install stub shaft. **NOTE:** The sun shaft and a socket can be used to perform this procedure.

Figure 197

Step #1
Hold pinion and rotate side gear five turns in each direction. Differential clutch must turn freely with a maximum torque of 34 Nm [25 LBF/FT].

Step #2
Hold side gear and rotate pinion in both directions to make several passes through the gear contact checking compound on the ring gear.

Figure 198
Inspect tooth contact pattern on ring gear. Compare to tooth bearing charts on *pages 25 & 26* and make adjustments if necessary as indicated.

Hydraloc Seal Retainer Assembly and Installation

Figure 199
Apply continuous coat of Loctite 620 or equivalent to outside diameter of inner Hydraloc seal.

Figure 200
Using appropriate driver install inner Hydraloc seal.
NOTE: Seal is installed with sealing lip down or towards center of seal retainer. Reference tool drawing on *page 90*.

Figure 201
Apply continuous coat of Loctite 620 or equivalent to outside diameter of outer Hydraloc seal.

Figure 202
Using appropriate driver install outer Hydraloc seal.
NOTE: Seal is installed with sealing lip down or towards center of seal retainer. Reference tool drawing on *page 91.*

Figure 203
Apply Loctite 262 or equivalent to seal retainer plug.

Figure 204
Install seal retainer plug.
NOTE: Plug end to be flush with mating surface.

Figure 205
Coat with grease, to hold in position, and install (2) seal rings in seal retainer.

Figure 206
Insert seal retainer installation tool.
Reference tool drawing on *page 95*.

Figure 207
Coat inner and outer Hydraloc seal lips with grease.

Figure 210
Tighten seal retainer cap screws to
24-27 Nm [18-20 LBF/FT].

Figure 208
Carefully install seal retainer.
Note: Holes on seal retainer must be aligned with holes on the pressure and tank ports on the differential retainer.

Figure 211
Apply Loctite 262 or equivalent to differential adjusting nut lock socket head screw.
Install socket head screw in one of the two holes that allow it to clear the lugs on the adjusting nut.

Figure 209
Install (4) seal retainer cap screws.

Figure 212
Tighten adjusting nut socket head lock screw to
48-50 Nm [35-37 LBF/FT].

Hydraloc Air Leakage Test

Figure 213
Air pressure test per procedure on *page 18*.

Hydraloc Hydraulic Leakage Test

Figure 214
Hydraulic pressure test per procedure on *page 18*.

Hydraloc Functional Test

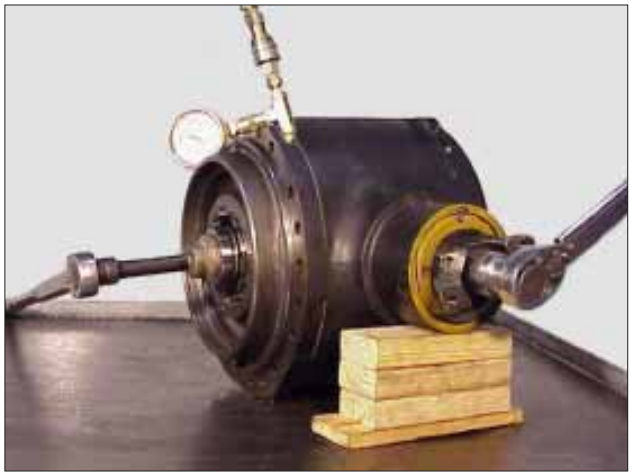


Figure 215
Functional test per procedure on *page 18*.

Figure 216
Install (2) bleeder screws and seats.
Tighten to 9-14 Nm [7-10 LBF/FT].

Figure 217
Install (2) brake supply port plugs and (1) drain and oil level plug. Tighten to 41-47 Nm [30-35 LBF/FT].

Figure 218
Install (2) Hydraloc port plugs.
Tighten to 41-47 Nm [30-35 LBF/FT].

Brake Piston Reassembly

Figure 219
Lubricate, stretch and install (1) outer piston seal. Lubricate, stretch and install (1) outer piston backup ring on top of piston seal.
For proper ring placement reference ***Figure 223***.

Figure 221
Install piston.

Figure 220
Lubricate, stretch and install (1) inner piston seal. Lubricate, stretch and install (1) inner piston backup ring on bottom of piston seal.

Figure 222
Fabricate and install plates and spacers as shown. Evenly tighten bolts to push piston into bore. Repeat procedure on opposite side.

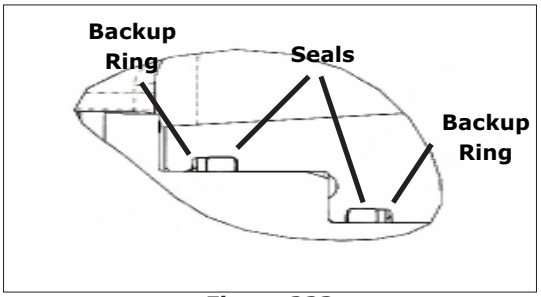


Figure 223

Brake Air Test

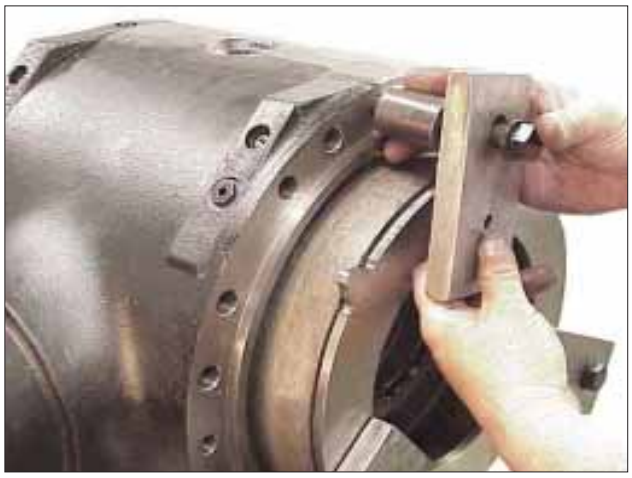


Figure 224
Install brake assembly retaining plates.

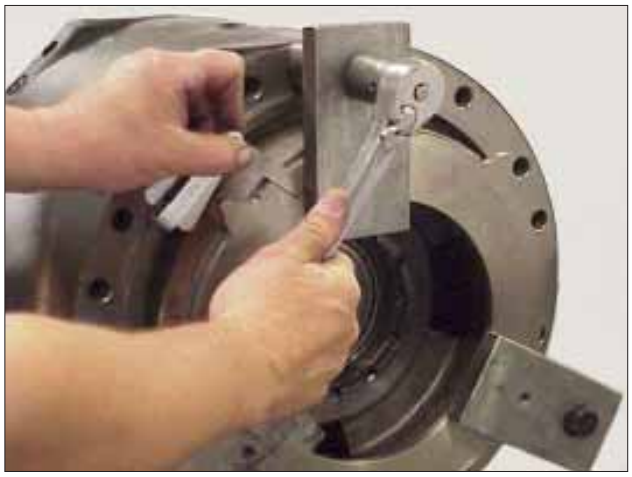


Figure 225
Tighten screws.
NOTE: Leave 3.81 mm (.149”) clearance between retaining plates and brake to allow movement of brake.
IMPORTANT: Do not hydraulic test.

Figure 226
Remove bleeder and seat. Install air tester as shown. This checking device is comprised of minimum 690 kPa [30 psi] air gauge, air shut off valve and regulator.
Apply 83 kPa (12 psi) for 20 seconds.
Allow another 20 seconds for air stabilization period.
Allow another 10 seconds for decay period.
A maximum of 8 kPa decay allowed. If decay exceeds 8 Pa [.001 psi] repeat above steps.
If decay exceeds 8 Pa [.001 psi] after 3 trials, disassemble and inspect for cause.
Correct and retest.
Repeat test on opposite side.
Note: Alternate decay/periord is .69kPa [.1 PSI] per 5 minutes.

Figure 227
Install bleeder seat flat side down, Install bleeder and tighten to 9-14 Nm [7-10 LBF/FT].

Brake Piston Positioning "Clocking"

Figure 228

Prior to installing the trumpet arm it is **"Imperative"** that the brake piston ears be in the correct position. If the piston ears are out of position during reassembly they may break or the piston return springs will not make contact, possibly causing brake drag. Temporarily install the abutment plate on the piston, engaging the cutouts in the abutment plate with the ears on the piston as shown.

Figure 229

Using the dowel pin hole as reference install (2) alignment pins as shown in the 4th and 9th holes from the dowel pin hole.

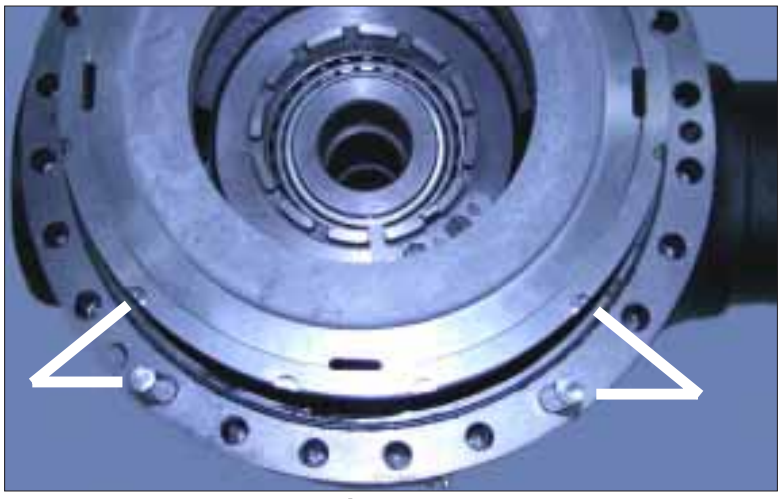


Figure 230

Measure the distance form alignment pins to eye brows in abutment plate. Turn abutment plate to position the eye brows an equal distance from each pin. Carefully remove abutment plate without disturbing piston position. Perform this procedure on both brake pistons.

Trumpet Arm Reassembly

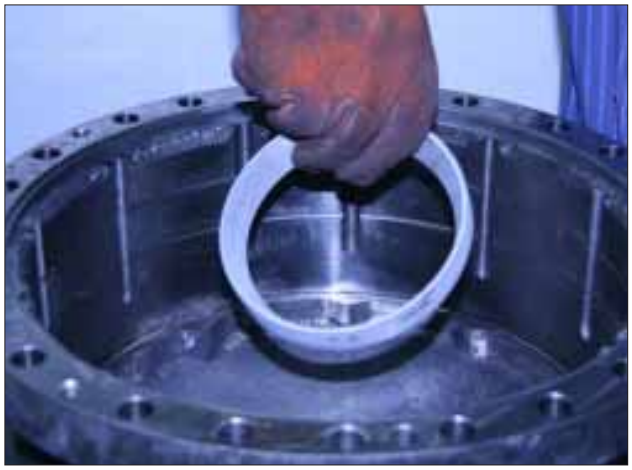


Figure 231
Freeze inner wheel bearing cup and install. Reference bearing heating and freezing guidelines on *page 23*.

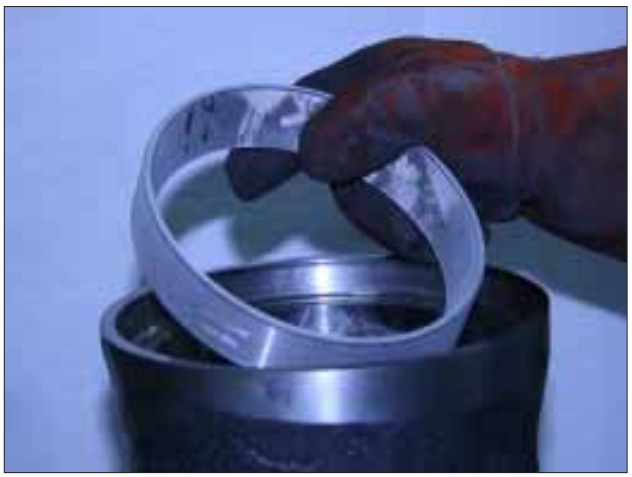


Figure 234
Freeze outer wheel bearing cup and install.

Figure 232
Using a soft bar tap around bearing cup to assure it is properly seated in bore.

Figure 235
Using a soft bar tap around bearing cup to assure it is properly seated in bore.

Figure 233
Using a feeler gauge check between cup and housing in several places to be sure bearing cup is properly seated. Reference bearing heating and freezing guidelines on *page 23.*

Figure 236
Using a feeler gauge check between cup and housing in several places to be sure bearing cup is properly seated.

Figure 237
Heat outer wheel bearing cone. Reference bearing heating and freezing guidelines on *page 23.*

Figure 238
Install outer wheel bearing cone.

Figure 239
Tap inner race of bearing to assure it is properly seated on shaft. **NOTE:** The old bearing race, as shown, works well for this procedure and minimizes the risk of damaging the bearing.

Figure 240
Using a feeler gauge check between cone and shaft shoulder in several places to be sure bearing cup is properly seated.

Face Seal Installation

Figure 241
Clean seal bore in axle shaft with solvent. Reference face seal installation instructions on *page 19*.

Figure 242
Clean metal ring sealing surface with a lint free cloth.

Figure 243
Install seal in installation tool.

Figure 244
Wet rubber toric ring with isopropyl alcohol or other approved evaporative solvent. Reference face seal installation instructions on *page 19.*

Figure 245
Install seal.

Figure 246
Check that seal is properly seated.
Wipe seal with lint free cloth and
apply light coat of oil to steel sealing surface.

Figure 247
Clean seal bore in trumpet arm with solvent.

Figure 248
Install seal in installation tool.

Figure 249
Wet rubber toric ring with isopropyl alcohol or other approved evaporative solvent. Reference face seal installation instructions on *page 19*.

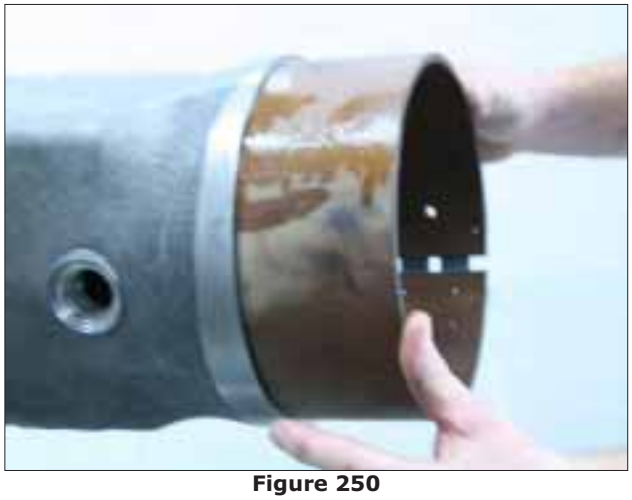


Figure 250
Install seal.

Figure 251
Check that seal is properly seated. Wipe seal with lint free cloth and apply light coat of oil to steel sealing surface.

Figure 252
Install axle shaft in trumpet arm. **NOTE:** Be careful to not damage the bearing cups or seals.

Figure 253
Heat inner bearing cone and install on axle shaft. **NOTE:** An assistant is needed for this procedure to hold the axle shaft centered in the bearing cup from the flange end. Reference ***figure 252***.

Figure 254
Using a soft bar tap bearing fully on the axle shaft. **NOTE:** An assistant is needed for this procedure to hold the axle shaft in position.

Figure 255
Install planet carrier.

IMPORTANT: Position planet carrier on the axle shaft splines so the threaded holes in shaft are equally spaced between the planet gear bearing bosses as shown in ***figure 258.*** This will allow access to the socket head screws between the gears when removing or installing a complete planetary assembly.

Wheel Bearing Preload Setting Procedure

Figure 256
Measure thickness of clamp plate and record.

Figure 257
Install clamp plate.

Figure 258
Install (4) socket head screws and tighten evenly to 33.9 Nm [25 LBF/FT].

Figure 259
Shock axle shaft flange in several locations while rotating shaft.

Figure 260
Retighten screws to 33.9 Nm [25 LBF/FT]. Repeat shocking and torquing until screws no longer advance at 33.9 Nm [25 LBF/FT].

Initial Shim Pack Calculation

Remove (4) socket head screws and rotate clamp plate until holes in plate and shaft do not line up. Using depth gauge measure from top of clamp plate to end of axle shaft. Subtract thickness of clamp plate recorded in *figure 256* from depth measurement for initial shim thickness.

EXAMPLE:

Depth Measurement	**21.2 mm [.83”]**
Clamp Plate Thickness	**22.6 mm [.88”]**
Initial Shim Pack	**1.4 mm [.050”]**

Figure 261

Figure 262
Select an initial shim pack thickness from the calculation in ***figure 261.***
NOTE: The original shim pack or 1.4 mm [.50”] may also be used as a starting point.

Figure 263
Install clamp plate, (4) socket head screws and shim pack.

Figure 264
Tighten (4) socket head screws evenly to 286-316 Nm [211-233 LBF/FT] while rotating axle shaft.

Figure 265
Rotate and shock shaft.

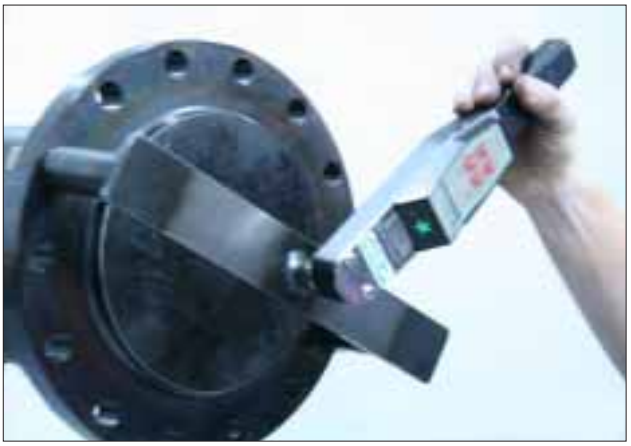


Figure 266
Measure rolling torque. Adjust shim pack thickness as required by repeating steps in ***figures 262-266*** to attain a rolling torque within 16-23 Nm [12-17 LBF/FT]. **NOTE:** Rolling torque must be returned to 0.0 before increasing shim pack thickness by shocking shaft after screws are loosened.

Figure 267
Remove (4) socket head screws, one at a time, apply Loctite 262 or equivalent and reinstall.

Figure 268
Tighten (4) socket head screws evenly to 286-316 Nm [211-233 LBF/FT] while rotating axle shaft.

Figure 269
Heat planet gear and bearing assembly. Reference bearing heating and freezing guidelines on *page 23*.

Figure 270
IMPORTANT: Large radius on bearing inner race must be installed down or towards the planet carrier.

Figure 271
Install planet gear and bearing assembly.

Figure 272
Install planet gear and bearing snap ring.

Figure 273
Turn snap ring in groove to verify that it is fully seated in groove. Repeat steps in ***figures 269-273*** for remaining (3) planet gears.

Figure 274
Install internal ring gear.

Figure 275
Align eye brows in ring gear with eye brows in trumpet arm.

Figure 276
Install (12) dowel pins.

Figure 277
Install snap ring.
NOTE: If axle has brakes, snap ring is not used in this position, proceed to ***figure 280.***

Figure 278
Position snap ring ends between eye brows as shown.

Figure 279
Install sun gear. **NOTE:** This completes reassembly of trumpet arm on an axle without brakes. Repeat process for opposite trumpet arm.

Figure 280
Install brake abutment plate aligning eye brows in plate with dowel pins. **NOTE:** If brake pistons have not been positioned on the differential assembly the abutment plate is needed for that procedure. Reference ***figures 228-230*** to align pistons.

Figure 281
Install snap ring. Center snap ring ends between eye brows in housing. Reference ***figure 278.***

Figure 282
Apply heavy coat "glob" of grease to (4) brake piston return springs and install. Install sun gear.

Figure 283
Coat both sides of brake friction plate with axle lubricant and install.

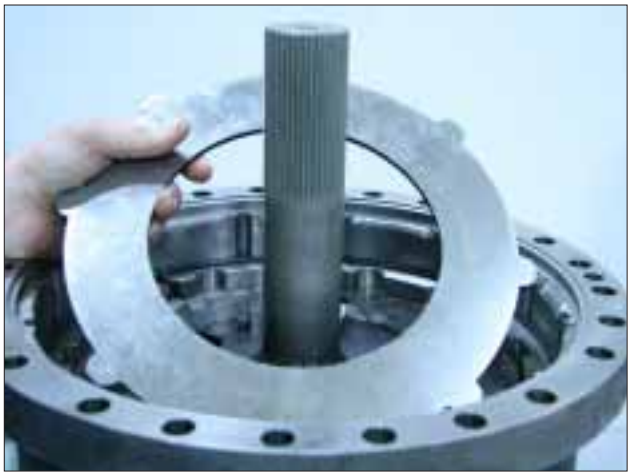


Figure 284
Install brake reaction plate.
Repeat process for opposite trumpet arm.

Trumpet Arm Installation

Figure 285
Lubricate differential to trumpet arm o-ring with grease.

Figure 286
Carefully stretch and install o-ring.

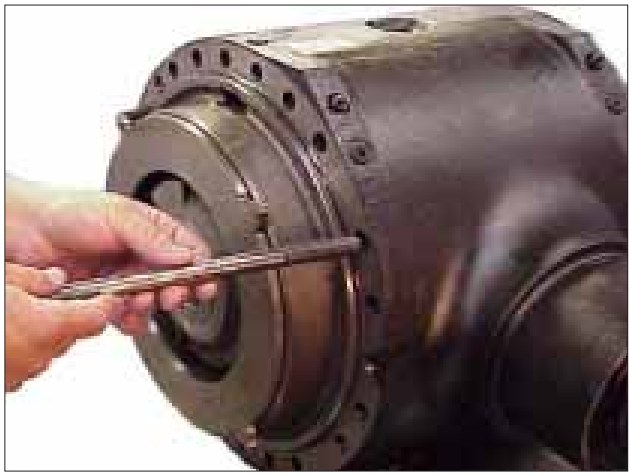


Figure 287
Install (2) alignment pins 180° apart.
IMPORTANT: Make sure brake pistons are properly aligned prior to installing trumpet arm in the next procedure. Reference ***figures 228-230.***

Figure 288
Install trumpet arm assembly.
IMPORTANT: Trumpet arm should be pushed on by hand. The only resistance should be from the brake return springs as it makes contact with differential housing. When released the piston return springs should separate the housings slightly as shown in ***figure 289*** indicating proper alignment.

Figure 289
Install (22) socket head screws and washers. Finger tighten several only until housings are in full contact with each other.

Figure 290
Remove (2) alignment pins and install socket head screws and washers.

Figure 291

Tighten (24) socket head screws to 286-316 Nm [211-233 LBF/FT].
Install level plug and tighten to 81-88 Nm [60-65 LBF/FT].
Repeat process for opposite trumpet arm.

Axle Air Test

Figure 292

Install axle air tester. This checking device is comprised of minimum 690 kPa [30 psi] air gauge, air shut off valve and regulator. Axle input pinion to be turned by hand (2) complete revolutions. Apply 83 kPa [12 psi] air pressure to axle assembly. Allow 30 second stabilization period. Lock off pressure. Monitor decay for 5 minutes. If excessive decay occurs 7 kPa [.1 psi]), disassemble axle and inspect for cause. Reassemble and retest. Install level plug and tighten to 81-88 Nm [60-65 LBF/FT].

Trunnion Mount Removal and Disassembly

Figure 293
Remove (12) front trunnion cap screws and washers. Remove trunnion cap and shims.

Figure 296
Remove (14) socket head screws from front trunnion journal. **NOTE**: Remove screws and journal only if replacement is required.

Figure 294
Remove thrust washer.

Figure 297
Remove trunnion bracket if required.

Figure 295
Remove front trunnion.

Figure 298
Remove seal ring.

Figure 299
Remove radial bushing.

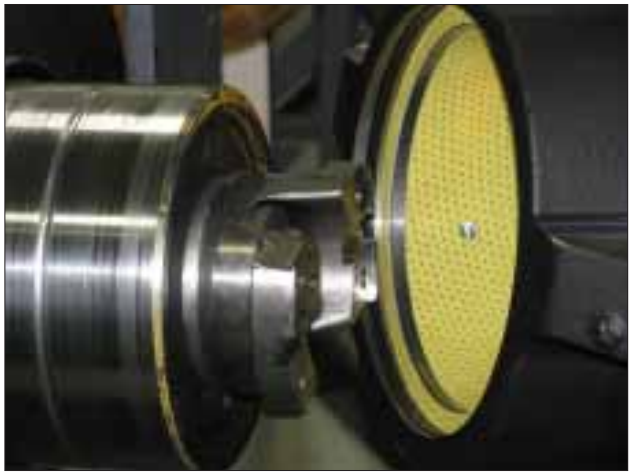


Figure 300
Remove rear trunnion.
NOTE: Using appropriate puller remove trunnion sleeve if replacement is required.

Figure 301
Remove outer seal ring.

Figure 302
Remove inner seal ring.

Figure 303
Remove thrust washer.

Figure 304
Remove radial bushing.

Trunnion Mount Reassembly and Installation

Figure 305
Install trunnion journal with (12) socket head screws and washers.

Figure 308
Install seal ring.

Figure 306
Tighten socket head screws to 286-3196 Nm [211-233 LBF/FT].

Figure 309
Install front trunnion.

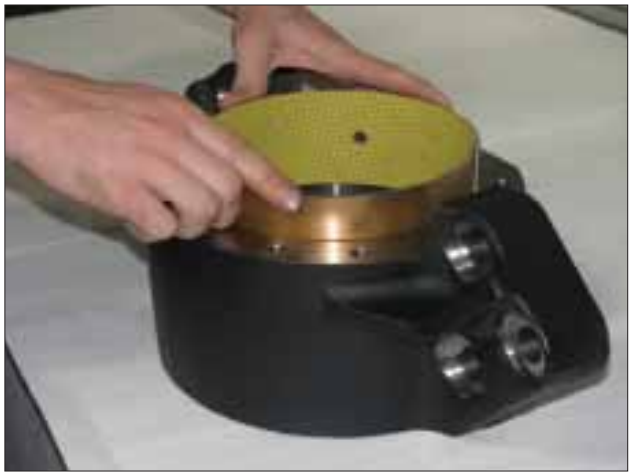


Figure 307
Install radial bushing in front trunnion.

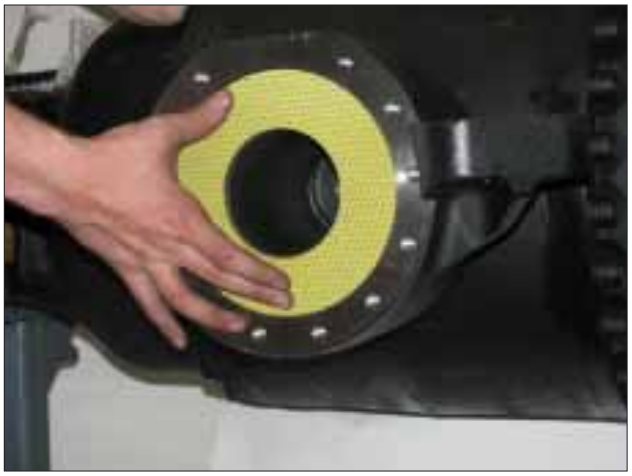


Figure 310
Install thrust washer. **IMPORTANT:** Laminated (yellow) surface must be towards trunnion cap.

Figure 311
Install original shims and trunnion cap with (14) cap screws and washers.
Tighten to 99-107Nm [73-79LBF/FT].

Figure 314
Install thrust washer.
IMPORTANT: Laminated (yellow) surface must be towards the differential center.

Figure 312
Install radial bushing in rear trunnion.

Figure 315
Install outer seal ring.

Figure 313
Install inner seal ring.

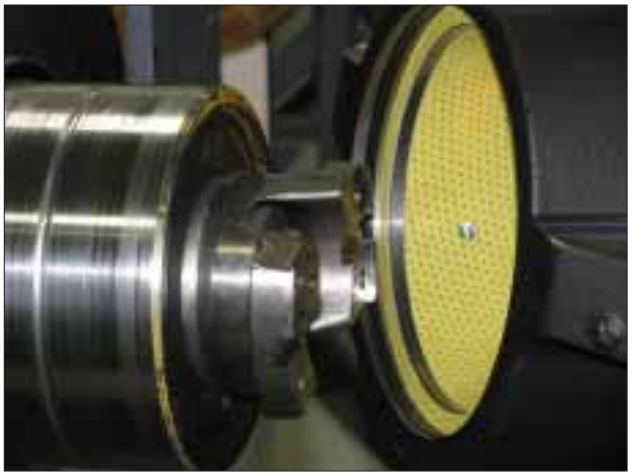
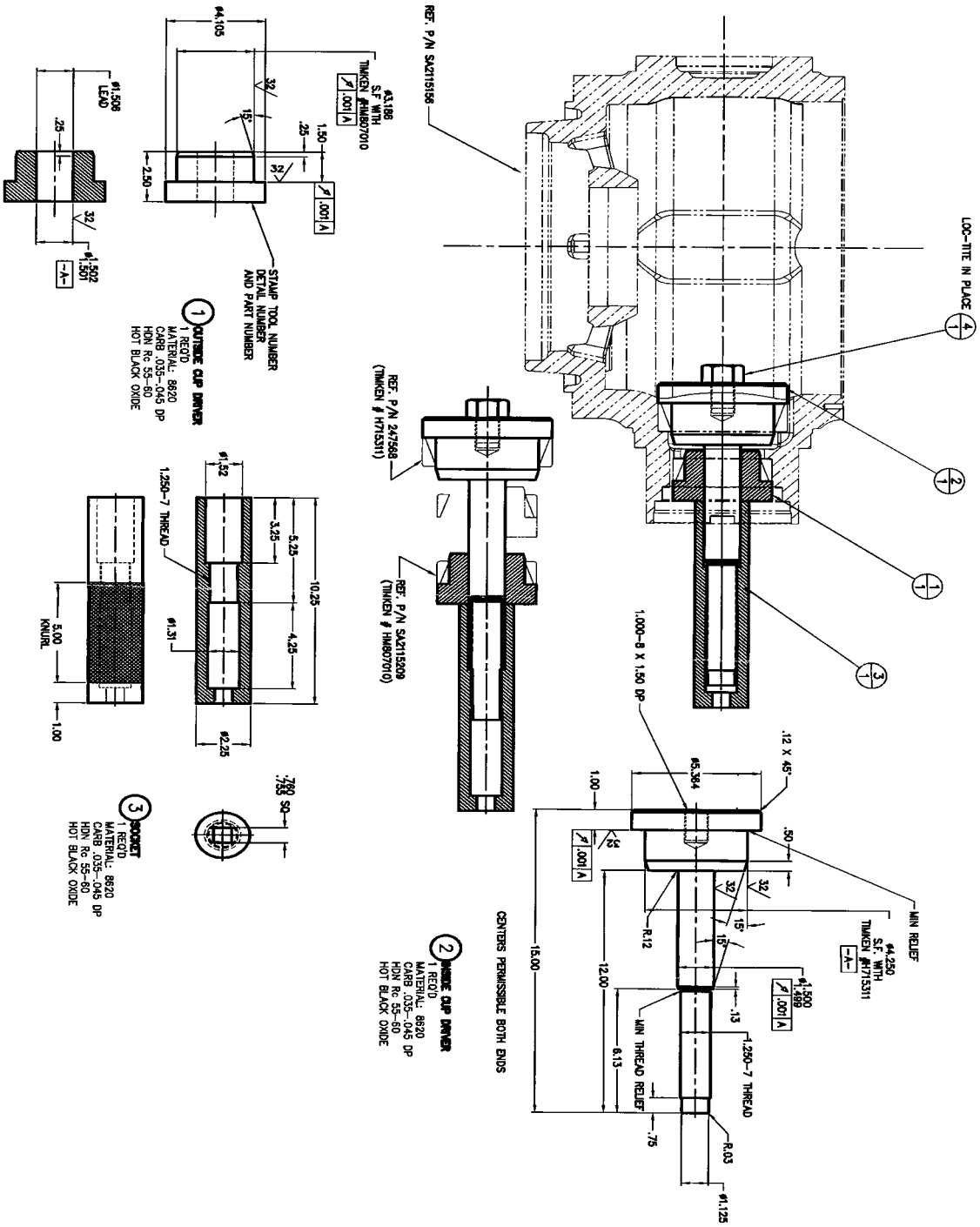


Figure 316
Install rear trunnion.

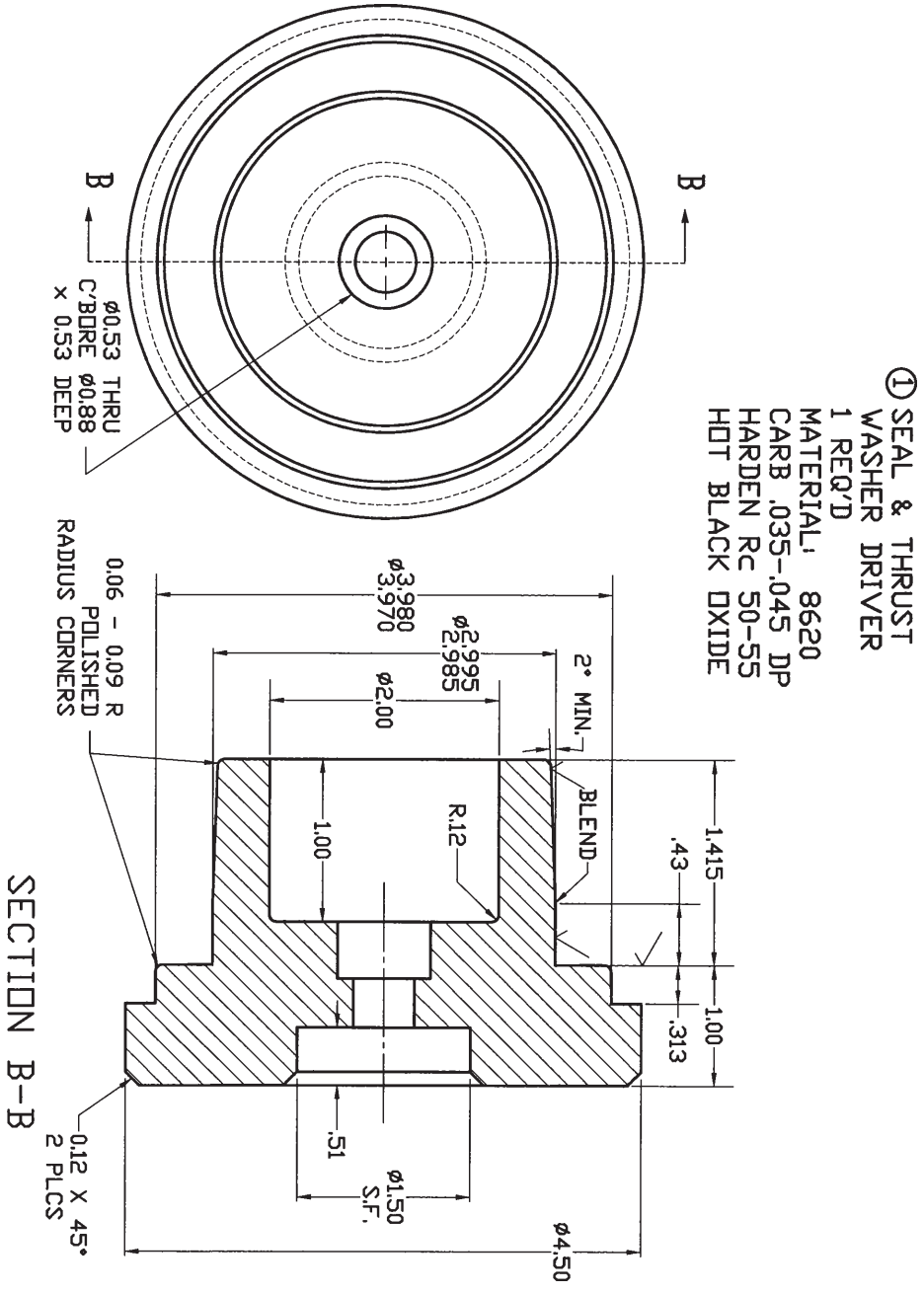
Figure 317
Install (1) Relief valve in recessed hole in rear trunnion and (1) relief valve in front trunnion cap.
Tighten to 19-22 Nm [14-16 LBF/FT].

Figure 318
Temporarily install grease fittings in the front and rear trunnions. Apply grease to fitting until it escapes from relief valves.
Replace grease fittings with pipe plugs and tighten to 19-22 Nm [14-16 LBF/FT].
NOTE: Trunnions should be greased at every normal servicing interval. Machines in conditions where the axle routinely becomes submerged should be serviced more often.

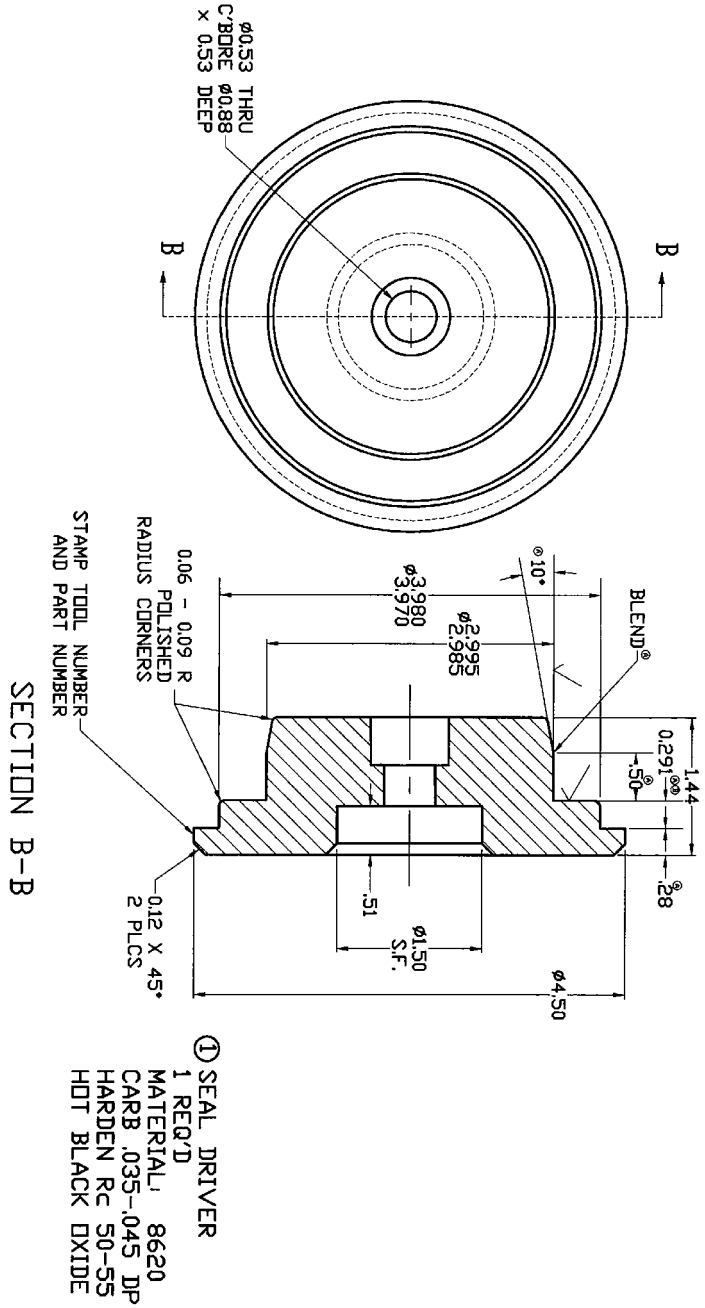
DIFFERENTIAL CARRIER CUP DRIVERS



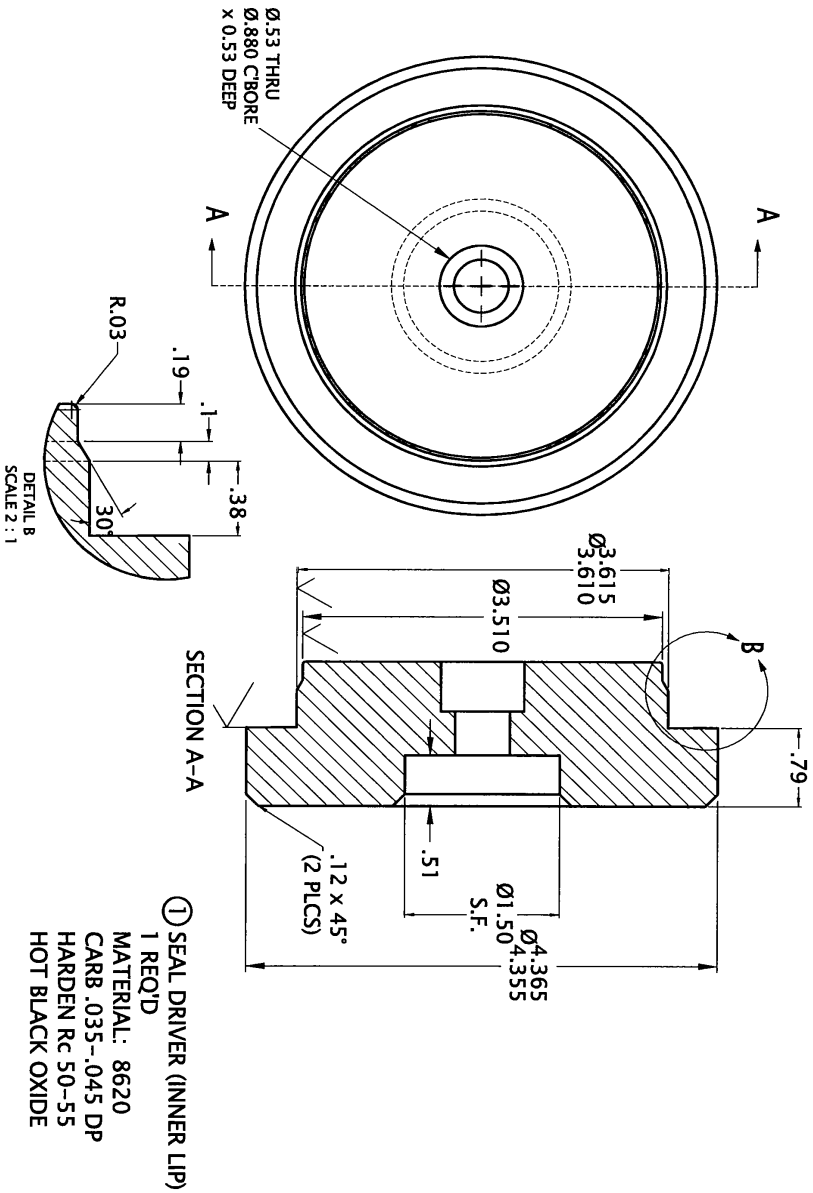
PINION GREASE SEAL AND WASHER DRIVER



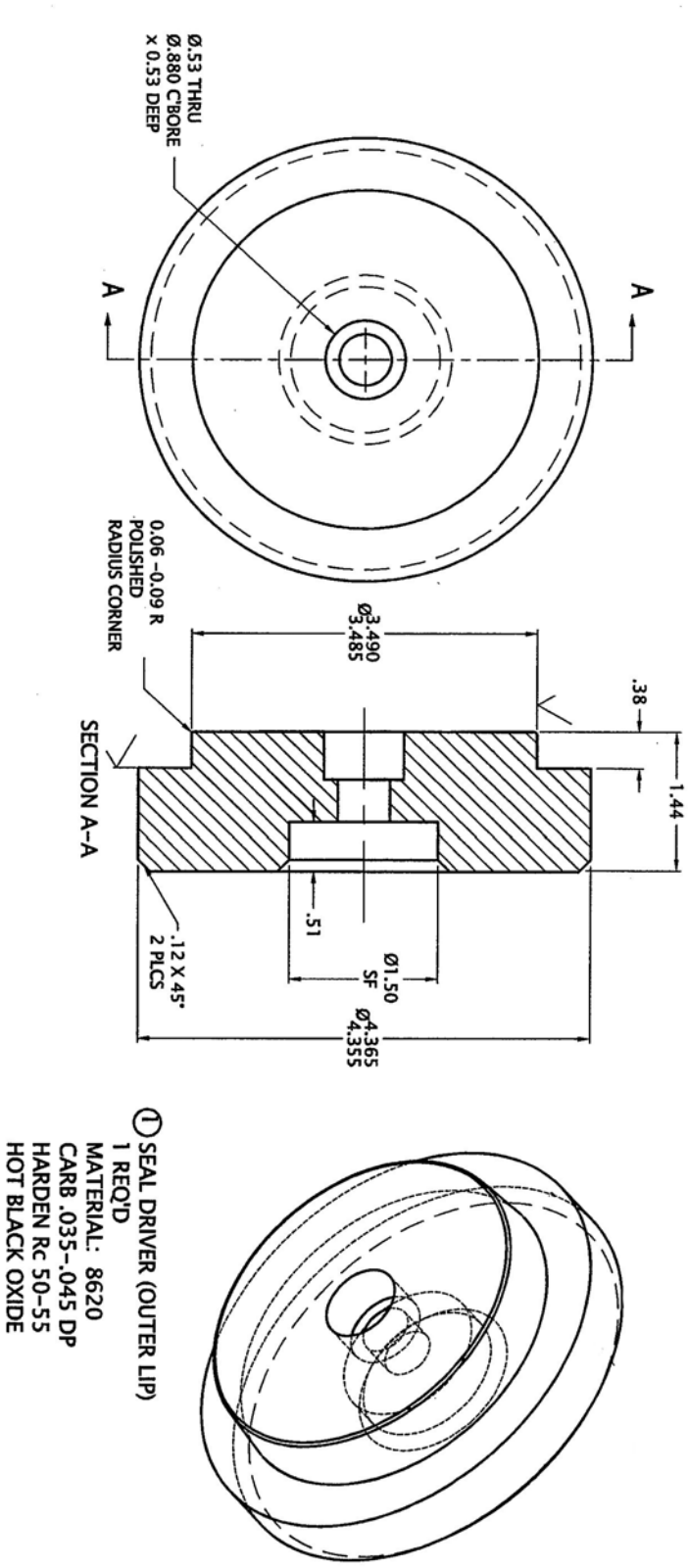
PINION OIL SEAL DRIVER



INNER LIP SEAL DRIVER

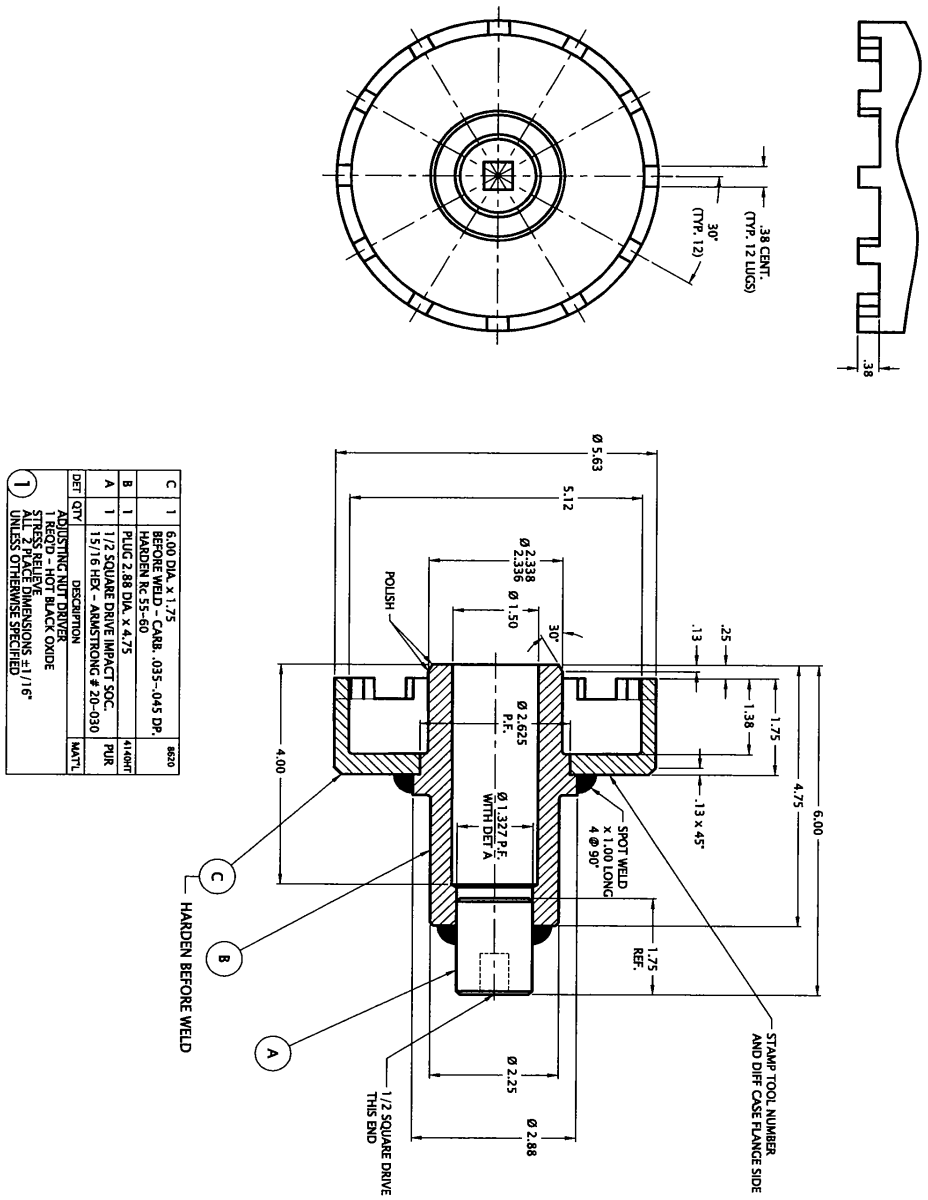


OUTER LIP SEAL DRIVER



① SEAL DRIVER (OUTER LIP)
1 REQ'D
MATERIAL: 8620
CARB .035–.045 DP
HARDEN Rc 50–55
HOT BLACK OXIDE

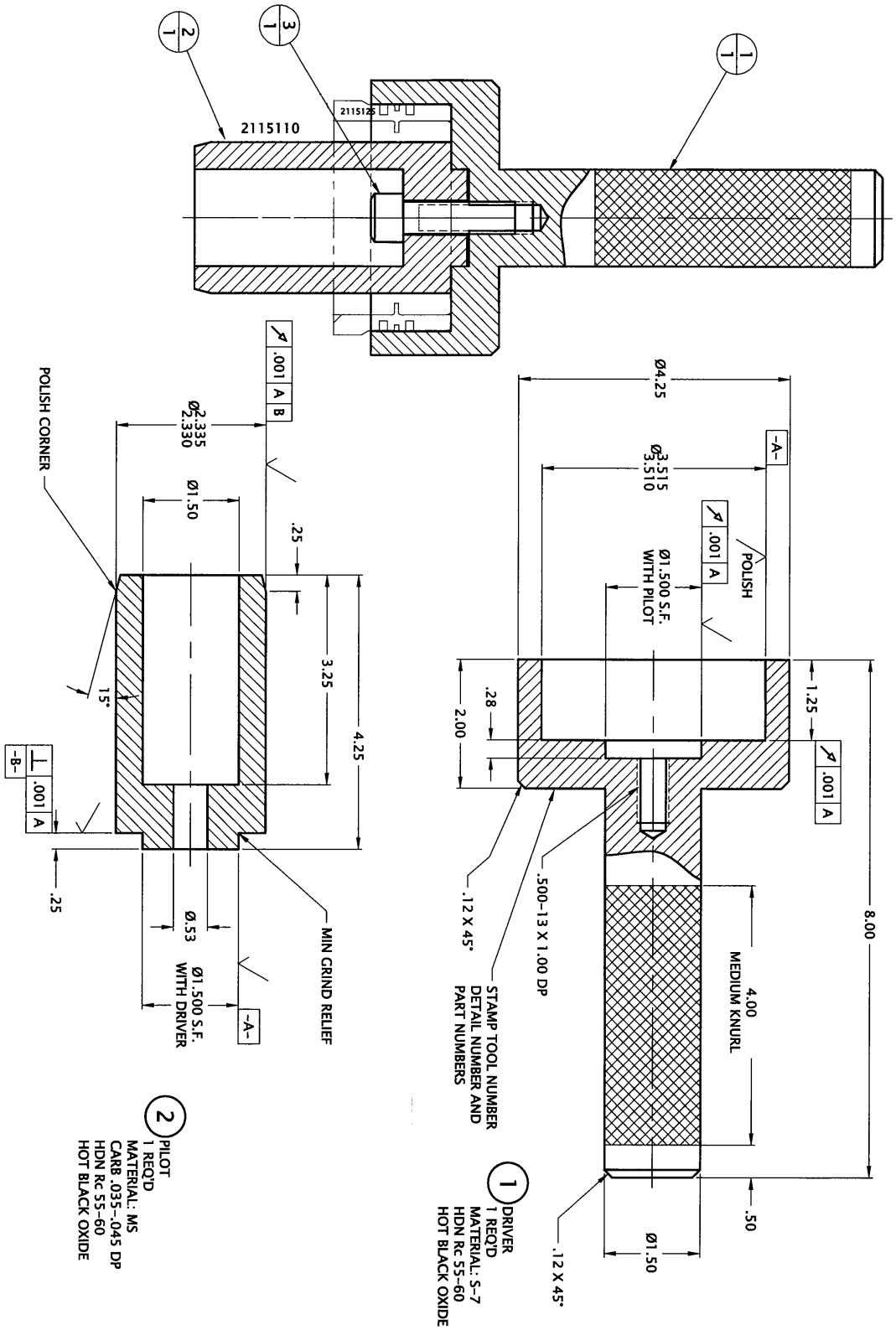
ADJUSTING NUT DRIVER



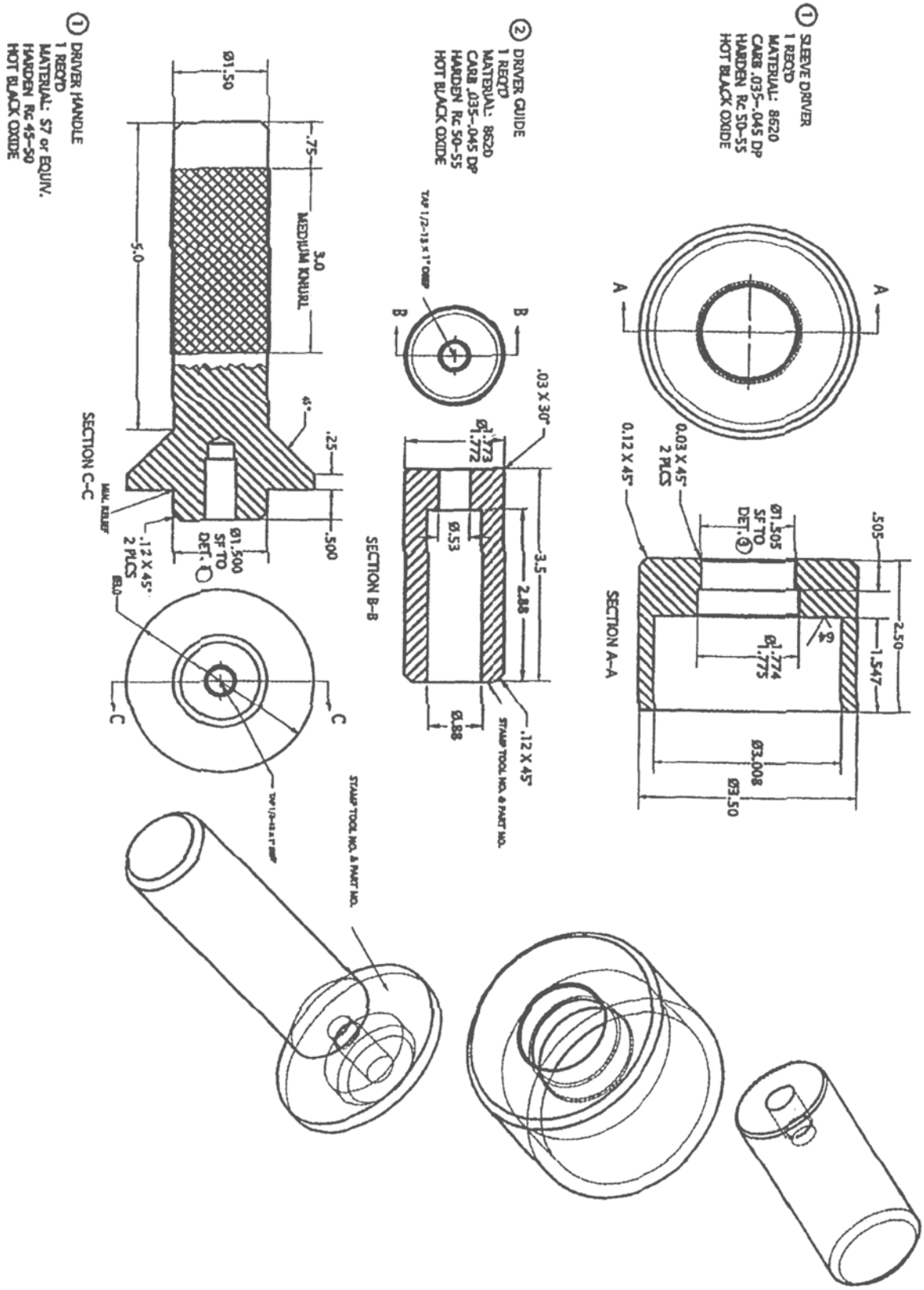
DET	QTY	DESCRIPTION	MATL
C	1	6.00 DIA. x 1.75 BEFORE WELD – CARB. .035-.045 DP. HARDEN RC 55-60	8620
B	1	PLUG 2.88 DIA. x 4.75	4140HT
A	1	1/2 SQUARE DRIVE IMPACT SOC. 15/16 HEX – ARMSTRONG # 20-030	PUR

ADJUSTING NUT DRIVER
1. RECORD – HOT BLACK OXIDE
STRESS RELIEVE
ALL 2 PLACE DIMENSIONS ±1/16"
UNLESS OTHERWISE SPECIFIED

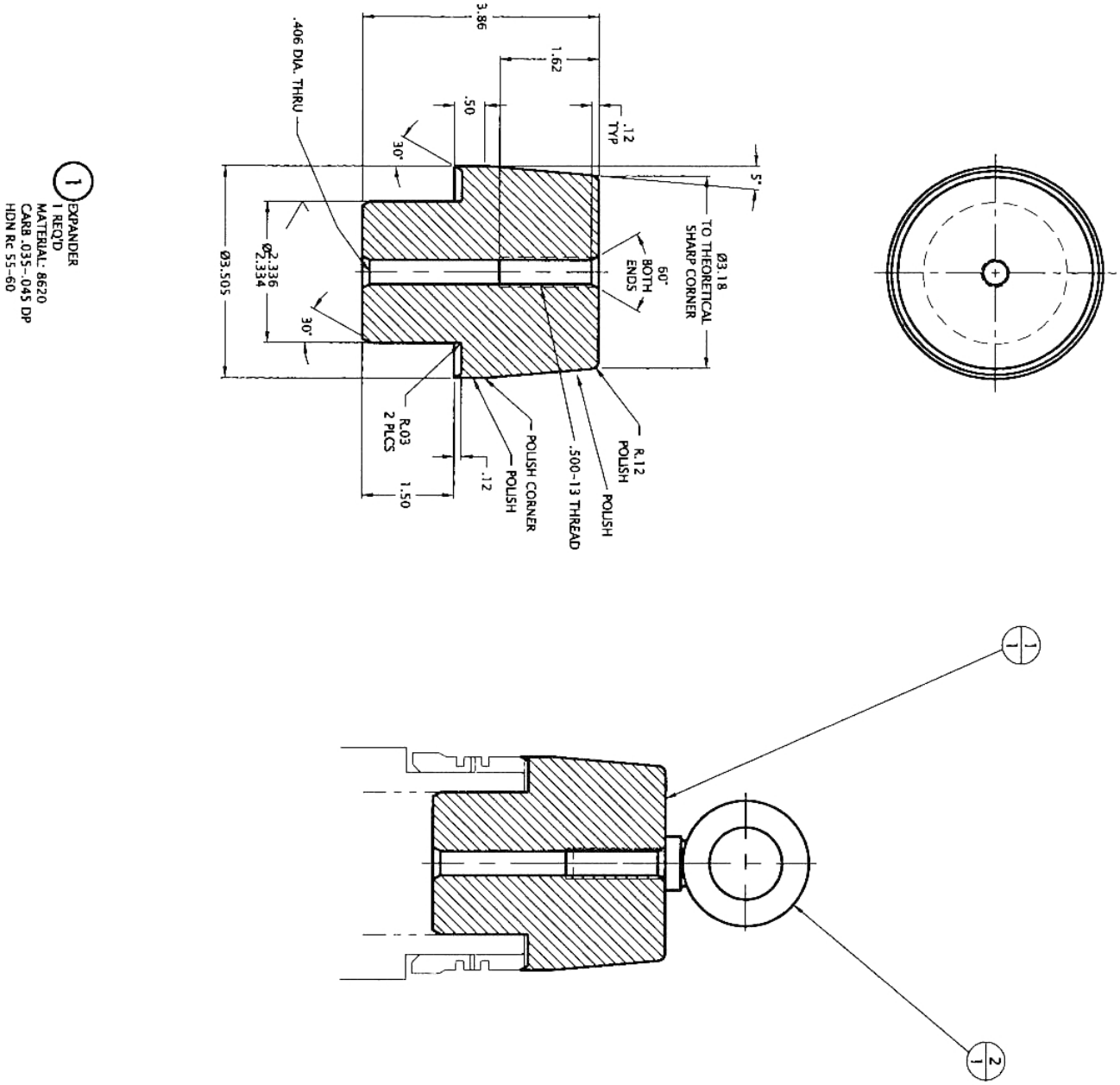
HYDRALOC SLEEVE DRIVER



FLANGE WEAR SLEEVE DRIVER



SEAL RETAINER INSTALLATION TOOL



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